Compliments of the Author.

CALENDARS.

RULES, EXPLANATIONS, CONTRADICTIONS

AS TO

AC. TO CORRECT THE ERRORS OF NS., OS., AND AM.; AE.=ACTIAN; AM.=PRESENT GREEK; AU.=ANCIENT ROMAN; HC.=PRESENT HEBREW; HCM.=ANCIENT HEBREW; JE.=JULIAN; ME.=MOHAMMEDAN; NC.=ALEXANDRIAN; NE.=NABONASSAR; NS.=GREGORIAN; OE.=OLYMPIC; OS.=OLD STYLE.

BY

B. AYCRIGG,

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PREFACE.

The Appendix will answer the purpose of an explanatory Index. It contains explanations of symbols, and contractions, and scientific terms, and general principles. And under the head MD., the rules to determine for all time, the Mean Dates of new and of full moon, and of the equinoxes and solstices, which are proved to be correct by many historic dates, including numerous eclipses. And these astronomical rules form the basis of the present examinations.

The Rules are in all cases so simplified as to be worked by rote, without the necessity of understanding the principles which are explained in the notes. And no higher mathematics is required than addition, subtraction, multiplication, and division by decimals, according to specific directions.

The Explanations in the notes are condensed by avoiding repetition, and by substituting symbols for subordinate rules, and by references to other passages. This brings the explanations within a short space for those who assume that the calculations are correct and desire only the general result, while the symbols and references will reduce the labor of the student who desires to examine the subjects critically, since in some cases the results given by a few figures, require long and intricate calculations.

Contradictions, to what are believed to be correct, are numerous. As far as known, these are discussed in the notes, so that the reader has both sides when there is a difference.

Precision is a leading point in this work, and that is frequently overlooked by writers on these subjects, as in the following cases:

First. As to March 21 of the Paschal Canons. The British Act of Parliament of 1751 says that in AD. 325—the year of the Council of Nicea—the vernal equinox fell "on or about the 21st day of March." All other known authorities assert or imply that March 21 was the actual date. Now, the vernal equinox fell March 20 in AD. 325, whether counted from midnight at Greenwich, or from midnight at Jerusalem, or in Hebrew time, from 6 hours before midnight at Jerusalem. But in all these modes of counting time it fell on March 21 in each third year after bissextile about that time, and the Paschal Canon required the *latest* date upon which it could fall, and therefore said: "The 21st day of March shall be *accounted* the vernal equinox."

Second. As to Turkish dates (ME.). Authors of the highest standing differ as to dates. One charges another with error on account of the difference. But neither of them defines how he counts his dates. Some dates correspond with July 15 and others with July 16 AD. 622 as the beginning of the era. Now: new moon fell AD. 622 July 14 at 8 hours 17 minutes AM. at Mecca, and became visible before evening after noon of July 15 when the era began. Hence some count

the era as beginning July 15 in civil time, and others as beginning July 16 in Mohammedan time, which like Hebrew time, begins on the previous evening. The dates are identical, but require specification.

Third. As to the ancient Hebrew Calendar (HCM.). All agree that during the second temple (which was destroyed by Titus in AD. 70) the beginning of Nisan depended upon the actual appearance of new moon. But no known author defines at which end of this day of the visible moon did Nisan begin, except Maimonides. And he states distinctly that Nisan began in the evening *after* the appearance of the new moon. And he believes that such was the Mosaic rule. And the facts stated by Josephus (who was present) show that the last sacrifices in the temple agreed with this rule. Hence by the Mosaic rule Nisan could not possibly begin before 18 hours *after* conjunction, nor could the Passover fall *as early as* on the day of full moon, but might fall two days after the day of full moon.

Fourth. As to the present Hebrew Calendar (HC.). Many different authors give different rules, to simplify the calculations in this—the most occult, and the most complicated of all calendars. But no known author states distinctly what these dates signify when found, except Maimonides, who says: "If the date fall a moment before noon, the calendar is celebrated on that day." This gives the rule for the present practice. Hence Tisri may commence "a moment" less than 18 hours *before* conjunction, and Nisan may commence about 13½ hours *before* conjunction. And this makes the Passovers fell *on* the day of full moon, or the day *before* full moon. These were impossible under the Mosaic rule which governed dates at the time of the Crucifixion, and have an important bearing on the question as to which of the six years, from AD. 28 to AD. 34, assigned by different authors, was the actual year of the Crucifixion.

Fifth. As to the Olympic Era (OE.). No known author professes to give precise Olympic dates, except Scaliger. And his rules are only approximations.

If the reader detect an error he will confer a favor by so informing the author.

PASSAIC, N. J. B. AYCRIGG.

"*Nequid actum reputans si quid superesset agendum.*"

AC.*

AC.=AMENDED CALENDAR TO CORRECT THE ERRORS OF NS. OS., AM.

Summary.

The Crucifixion occurred on the 14th day of Nisan, during the second temple, when the regular 14th Nisan fell on the day of full moon on, or next after the vernal equinox. The *Quarto-decimans* of Asia held Easter on this day, until in AD. 325, the Council of Nicea decided that it should be held on the Sunday next thereafter. This date was annually determined by Egyptian astronomers until the century after the Council, when the Alexandrian Canon (NC.) was adopted as a substitute. This gave the correct dates of the 235 new moons in a cycle of 19 years, about AD. 325.

OS. was adopted by the Council of Chalcedon in AD. 534 to give the dates of the 19 Paschal full moons in the cycle. It departed from the Nicean rule on three points. *First,* it added only 13 days to the Egyptian dates of new moon, and this brought Easter on the forbidden 14th Nisan. *Second,* it omitted one full moon of Nisan, and substituted one full moon of Zif. *Third,* it assumed that 235 lunations are exactly equal to 19 years, which caused an accumulation of moons of Zif. And AM. is the same as OS., in a Greek form, and now has five moons of Zif.

NS. was established AD. 1582 to correct the errors of OS. And AC. in the form of NS., is an astronomical analysis of NC., NS., OS., AM., with the following results.

AC. Table I. illustrates the Egyptian form of the cycle as used in all Christian calendars.

AC. Tables II., III. contain all the corrections of NS. Tables II., III., which contain the entire Gregorian system, with the following differences.

AC. SC. are the same as NS. SC. until AD. 6000. AC. Indexes give the precise mean dates of the Paschal full moons in maximum Hebrew time, while NS. Indexes are always less, and allow Easter to fall on the forbidden 14th Nisan. And after AD. 7789 they will be the 14th Zif in the standard year. And the present Hebrew Calendar has similar departures from the ancient rules.

In both Tables III. the dates are determined by Egyptian rules. AC. leaves them as they fall. But NS. retracts all GN. which fall on April 19 to second April 18, and all GN. from 12 to 19, from April 18 to second April 17. And these retractions bring Easter on the forbidden 14th Nisan, when the other dates are correct. And they originate in the errors of OS. as above stated.

Dr. Seabury in his "Theory and Use of the Church Calendar," says: "Science must come down from her throne and condescend to accept the cycles which the custodians of the Church have treasured up." But the Church itself has frequently changed its cycles. It is purely an astronomical question to determine whether NS., OS., or AM. represent the decision of the Council of Nicea. Its importance is a matter of opinion. Science deals only with facts.

* See NS. Preface.

AC.

AC. TABLE I.

January.			February.			March.				April.				May.			June.		
Days.	Sunday L.	GN.	Days.	Sunday L.	GN.	Days.	Sunday L.	Epacts.	GN.	Days.	Sunday L.	Epacts.	GN.	Days.	Sunday L.	GN.	Days.	Sunday L.	GN.
1	A	5	1	D		1	D		5	1	G	12		1	B	13	1	E	2
2	B		2	E	13	2	E			2	A	11	13	2	C	2	2	F	
3	C	13	3	F	2	3	F		13	3	B	10	2	3	D		3	G	10
4	D	2	4	G		4	G		2	4	C	9		4	E	10	4	A	
5	E		5	A	10	5	A			5	D	8	10	5	F		5	B	18
6	F	10	6	B		6	B		10	6	E	7		6	G	18	6	C	7
7	G		7	C	18	7	C			7	F	6	18	7	A	7	7	D	
8	A	18	8	D	7	8	D		18	8	G	5	7	8	B		8	E	15
9	B	7	9	E		9	E		7	9	A	4		9	C	15	9	F	4
10	C		10	F	15	10	F			10	B	3	15	10	D	4	10	G	
11	D	15	11	G	4	11	G		15	11	C	2	4	11	E		11	A	12
12	E	4	12	A	12	12	A		4	12	D	1		12	F	12	12	B	1
13	F		13	B	1	13	B			13	E	*	12	13	G	1	13	C	
14	G	12	14	C		14	C		12	14	F	29	1	14	A		14	D	9
15	A	1	15	D	9	15	D		1	15	G	28		15	B	9	15	E	
16	B		16	E		16	E			16	A	27	9	16	C		16	F	17
17	C	9	17	F	17	17	F		9	17	B	26		17	D	17	17	G	6
18	D		18	G	6	18	G			18	C	25	17	18	E	6	18	A	
19	E	17	19	A		19	A		17	19	D	24	6	19	F		19	B	14
20	F	6	20	B	14	20	B		6	20	E			20	G	14	20	C	3
21	G		21	C	3	21	C	23		21	F		14	21	A	3	21	D	11
22	A	14	22	D		22	D	22	14	22	G		3	22	B		22	E	
23	B	3	23	E	11	23	E	21	3	23	A		11	23	C	11	23	F	19
24	C		24	F		24	F	20		24	B			24	D		24	G	8
25	D	11	25	G	19	25	G	19	11	25	C		19	25	E	19	25	A	
26	E		26	A	8	26	A	18		26	D		8	26	F	8	26	B	16
27	F	19	27	B		27	B	17	19	27	E			27	G		27	C	5
28	G	8	28	C	16	28	C	16	8	28	F		16	28	A	16	28	D	
29	A					29	D	15		29	G		5	29	B	5	29	E	13
30	B	16				30	E	14	16	30	A			30	C		30	F	2
31	C	5				31	F	13	5					31	D	13			

AC. Rule 1. For the date and day of the week of all full moons: Add one to the year AD., and divide S by the circle 19, and R=GN. Then opposite to GN. in AC. Table I, find the date and Sunday letter of each full moon in that year in average standard time (from March 1st, AD. 1800, to March 1st, AD. 2100). And

AC. TABLE I.—*Continued.*

July.			Aug.			Sept.			Oct.			Nov.			Dec.		
Days.	Sunday L.	GN.	Days.	Sunday L.	GN.	Days.	Sunday L.	GN.	Days.	Sunday L.	GN.	Days.	Sunday L.	GN.	Days.	Sunday L.	GN.
1	G		1	C	10	1	F	18	1	A	18	1	D		1	F	
2	A	10	2	D		2	G	7	2	B	7	2	E	15	2	G	15
3	B		3	E	18	3	A		3	C		3	F	4	3	A	4
4	C	18	4	F	7	4	B	15	4	D	15	4	G		4	B	
5	D	7	5	G		5	C	4	5	E	4	5	A	12	5	C	12
6	E		6	A	15	6	D		6	F		6	B	1	6	D	1
7	F	15	7	B	4	7	E	12	7	G	12	7	C		7	E	
8	G	4	8	C		8	F	1	8	A	1	8	D	9	8	F	9
9	A		9	D	12	9	G		9	B		9	E		9	G	
10	B	12	10	E	1	10	A	9	10	C	9	10	F	17	10	A	17
11	C	1	11	F		11	B		11	D		11	G	6	11	B	6
12	D		12	G	9	12	C	17	12	E	17	12	A		12	C	
13	E	9	13	A		13	D	6	13	F	6	13	B	14	13	D	14
14	F		14	B	17	14	E		14	G		14	C	3	14	E	3
15	G	17	15	C	6	15	F	14	15	A	14	15	D		15	F	11
16	A	6	16	D		16	G	3	16	B	3	16	E	11	16	G	
17	B		17	E	14	17	A		17	C	11	17	F		17	A	19
18	C	14	18	F	3	18	B	11	18	D		18	G	19	18	B	8
19	D	3	19	G	11	19	C		19	E	19	19	A	8	19	C	
20	E		20	A		20	D	19	20	F	8	20	B		20	D	16
21	F	11	21	B	19	21	E	8	21	G		21	C	16	21	E	5
22	G		22	C	8	22	F		22	A	16	22	D	5	22	F	
23	A	19	23	D		23	G	16	23	B	5	23	E		23	G	13
24	B	8	24	E	16	24	A	5	24	C		24	F	13	24	A	2
25	C		25	F	5	25	B		25	D	13	25	G	2	25	B	
26	D	16	26	G		26	C	13	26	E	2	26	A		26	C	10
27	E	5	27	A	13	27	D	2	27	F		27	B	10	27	D	
28	F		28	B	2	28	E		28	G	10	28	C		28	E	18
29	G	13	29	C		29	F	10	29	A		29	D	18	29	F	7
30	A	2	30	D	10	30	G		30	B	18	30	E	7	30	G	
31	B		31	E					31	C	7				31	A	15

(Notes 17-30, 52, 53.)

for all time add the Index in AC. Table II, to March 20, and opposite to that date and corresponding Sunday letter and Epact, put GN. 3, and put all the other GN. at the same distance from GN. 3, as in AC. Table I. (Notes 17–28.)

And for the full moons of Nisan, make the dates one day later than in the table, and take the date and Sunday letter and Epact of any GN. which falls on or between March 21 and April 19, as belonging to that GN. to determine the date of Easter. (Notes 17–28.) Or:

AC. Rule 2. For the dates of the full moons of Nisan: To March 21, add the Index of the century in AC. Table II for the standard date of GN. 3. And make

AC. TABLE II.

Bissextiles.	Years AD.	AC. Solar Correction.	AC. Indexes.	Bissextiles.	Years AD.	AC. Solar Correction.	AC. Indexes.
	325	0	25.5867		5000	36	16.9029
	1288	8	0.9347		5100	37	17.5792
B	1600	10	1.9234	B	5200	37	17.2547
	1700	11	2.5943		5300	38	17.9305
	1800	12	3.2752		5400	39	18.6064
	1900	13	3.9510		5500	40	19.2823
B	2000	13	3.6269	B	5600	40	18.9582
	2100	14	4.3028		5700	41	19.6340
	2200	15	4.9786		5800	42	20.3099
	2300	16	5.6545		5900	43	20.9878
B	2400	16	5.3304	*	6000	44	21.6716
	2500	17	6.0062		6100	45	22.3375
	2600	18	6.6821		6200	46	23.0134
	2700	19	7.3580		6300	47	23.6892
B	2800	19	7.0338	B	6400	47	23.3649
	2900	20	7.7097		6500	48	24.0410
	3000	21	8.3856		6600	49	24.7168
	3100	22	9.0614		6700	50	25.3927
B	3200	22	8.7373	B	6800	50	25.0686
	3300	23	9 4132		6900	51	25.7444
	3400	24	10.0880		7000	52	26.4203
	3500	25	10.7649		7100	53	27.0962
B	3600	25	10.4408	B	7200	53	26.7720
	3700	26	11.1167		7300	54	27.4479
	3800	27	11.7925		7400	55	28.1238
	3900	28	12.4684		7500	56	28.7997
B	4000	28	12.2443	B	7600	56	28.4755
	4100	29	12.8201		7700	57	29.1514
	4200	30	13.4960	*	7789	58	0.3323
	4300	31	14.1719	B	7800	58	0.2967
B	4400	31	13.8487		7900	59	0.9725
	4500	32	14.5236	B	8000	59	0.6484
	4600	33	15.1995		8100	60	1.3243
	4700	34	15.8753		8200	61	2.0001
B	4800	34	15.5512		8300	62	2.6760
	4900	35	16.2271	B	8400	62	2.3519
					8500	63	3.0277

(Notes 31–51.)

AC. TABLE IV. / NS. IV.

Date.	Epact.	Sunday Letters.	1800 to 2099. GN.	1700 to 1899. GN.	1900 to 2199. GN.
Mar. 21	23	C	6	14	
22	22	D		3	14
23	21	E	14		3
24	20	F	3	11	
25	19	G			11
26	18	A	11	19	
27	17	B		8	19
28	16	C	19		8
29	15	D	8	16	
30	14	E		5	16
31	13	F	16		5
Apr. 1	12	G	5	13	
2	11	A		2	13
3	10	B	13		2
4	9	C	2	10	
5	8	D			10
6	7	E	10	18	
7	6	F		7	18
8	5	G	18		7
9	4	A	7	15	
10	3	B		4	15
11	2	C	15		4
12	1	D	4	12	
13	30	E		1	12
14	29	F	12		1
15	28	G	1	9	
16	27	A			9
17	26	B	9	17	17
18	25	C		6	6
19	24	D	17		
20		E			
21		F			
22		G			
23		A			
24		B			
25		C			
26		D			

(Rule 7. Notes 64, 65.)

March 21 and April 19 the limits. Then to GN. 3 and to all subsequent GN., add 8 in a circle of 19 years. And if this makes GN. 1 to 8, date it one day later, but if GN. 9 to 19 date it two days later until the date exceeds the limit, and then subtract 30 days to bring it within the limits. (Notes 55, 56.) Or:

AC. Rule 3. With the same standard date and limits: Subtract 11 days from the date of GN. 3 and of all subsequent GN. to find the date of the next larger GN., but subtract 12 days from the date of GN. 19 to find the date of GN. 1. And

AC. TABLE III.

Date of GN.	Sunday Letters	Epacts.	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	xiii	xiv	xv	xvi	xvii	xviii	xix
			GN. JP.=Golden Numbers used by the Westerns.																		
Mar. 21	C	23	8	19	0	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26
" 22	D	22	9	20	1	12	23	4	15	26	7	18	29	10	21	2	13	24	5	16	27
" 23	E	21	10	21	2	13	24	5	16	27	8	19	0	11	22	3	14	25	6	17	28
" 24	F	20	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29
" 25	G	19	12	23	4	15	26	7	18	29	10	21	2	13	24	5	16	27	8	19	0
" 26	A	18	13	24	5	16	27	8	19	0	11	22	3	14	25	6	17	28	9	20	1
" 27	B	17	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29	10	21	2
" 28	C	16	15	26	7	18	29	10	21	2	13	24	5	16	27	8	19	0	11	22	3
" 29	D	15	16	27	8	19	0	11	22	3	14	25	6	17	28	9	20	1	12	23	4
" 30	E	14	17	28	9	20	1	12	23	4	15	26	7	18	29	10	21	2	13	24	5
" 31	F	13	18	29	10	21	2	13	24	5	16	27	8	19	0	11	22	3	14	25	6
April 1	G	12	19	0	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7
" 2	A	11	20	1	12	23	4	15	26	7	18	29	10	21	2	13	24	5	16	27	8
" 3	B	10	21	2	13	24	5	16	27	8	19	0	11	22	3	14	25	6	17	28	9
" 4	C	9	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29	10
" 5	D	8	23	4	15	26	7	18	29	10	21	2	13	24	5	16	27	8	19	0	11
" 6	E	7	24	5	16	27	8	19	0	11	22	3	14	25	6	17	28	9	20	1	12
" 7	F	6	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29	10	21	2	13
" 8	G	5	26	7	18	29	10	21	2	13	24	5	16	27	8	19	0	11	22	3	14
" 9	A	4	27	8	19	0	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15
" 10	B	3	28	9	20	1	12	23	4	15	26	7	18	29	10	21	2	13	24	5	16
" 11	C	2	29	10	21	2	13	24	5	16	27	8	19	0	11	22	3	14	25	6	17
" 12	D	1	0	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18
" 13	E	0	1	12	23	4	15	26	7	18	29	10	21	2	13	24	5	16	27	8	19
" 14	F	29	2	13	24	5	16	27	8	19	0	11	22	3	14	25	6	17	28	9	20
" 15	G	28	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29	10	21
" 16	A	27	4	15	26	7	18	29	10	21	2	13	24	5	16	27	8	19	0	11	22
" 17	B	26	5	16	27	8	19	0	11	22	3	14	25	6	17	28	9	20	1	12	23
" 18	C	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29	10	21	2	13	24
" 19	D	24	7	18	29	10	21	2	13	24	5	16	27	8	19	0	11	22	3	14	25
			xvii	xviii	xix	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	xiii	xiv	xv	xvi
			GN. AM.=Golden Numbers used by the Greek Church.																		

(Rule 6; Notes 29, 30, 61–70, 120–130.)

when this makes the date earlier than the limit, add 30 days to bring it within the limits. (Notes 57, 58.)

AC. Rule 4. With the same limits: Add the Index of the century to March 24 or 54 for the key date. Then multiply any GN. by 11, and divide P by 30, and subtract R from the key date, and 2d R=the date of that GN., if within the lim-

its. If not, then add or subtract 30 days to bring it within the limits. (Notes 59, 60.)

AC. Rule 5. Subtract the Index of the century from 20 or 50 for the key Epact. Then multiply any GN. by 11, and add P to the key Epact, and divide S by 30, and R=the Epact of that GN. Then by Rule 2, or 3, or 4, find the date of that GN. (Notes 61–63.)

AC. Rule 6. To construct AC. Table III: By AC. Rule 1, or 2, or 3, or 4 and AC. Rule 5, find the dates of GN. and their epacts, on and between March 21 and April 19, assuming the Index of the century to be O. Then under each GN. JP. and opposite to its date and Epact, mark the index o. Then in each column, write down the indexes 1 to 29 in consecutive order, counting March 21 as next after April 19. Or add 13 days to the dates of the Epacts in the Roman Missal, omitting the double Epact (25) special at April 18, and marking Epact 24 at April 19. Then at the bottom put the Greek GN. (GN. AM.) 3 more or 16 less than the GN. JP. at the top of the column. (Note 64.)

AC. Rule 7. To construct AC. Table IV: In AC. Table II, find the Index of the century. Then in AC. Table III, find the same Index under each GN. JP., and over each GN. AM. and opposite to its date and Sunday letter, and Epact. Or, find the same in AC. Table I, by AC. Rule 1, for the Full moons of Nisan. (Note 65.)

Contra. Rule 8. For NS. dates and Epacts: Substitute NS. Table II for AC. Table II. Then use AC. Rules 1 to 7 with this modification, for NS. Retractions, viz.: If any date thus fall on April 19 retract it to April 18, and retract Epact 24 to Epact 25. And if any GN. from 12 to 19, thus fall on April 18, then retract it to April 17, and retract the Epact from 25 to 26, marking Epact (25) special to be used only with GN. 12 to 19. (Notes 66–70.)

AC. Rule 9. For NS. Dominical for all time, or for AC. Dominical until AD. 6000:

Divide the centuries by 4 and twice what does remain
Take from 6, and to the number you gain
Add the odd years and their fourth, which dividing by 7
What is left take from 7 and the letter is given.

And 1 to 7=A to G. And the letter thus found is for all the days in a common year, and for all the days in a leap year after Feb. 29, while the next letter after is for all the days before Feb. 29, counting A as next after G. And all the days which have the Sunday letter the same as the NS. Dominical for the year, are Sundays dated NS. in that year. And Sunday next after the date of the full moon of Nisan is Easter. And the AC. date of the full moon of Nisan is the date of GN. by AC. Tables II, III, IV, while the NS. date of the full moon of Nisan is the date of GN., by NS. Tables II, III, IV.

AC. Rule 10. The Sunday Letters for the 1st, 8th, 15th, 22d, 29th of each of the 12 months in succession, are the initials of the following 12 words:

At, Dover, Dwells, George, Brown, Esquire.
Good, Christian, Fitch, And, David, Friar.

They are given in AC. Table I. They are the same for AC., NS., OS., and for all time.

AC. 1st Example. AD. 1825=GN. 2, which AC. Table IV puts at April 4. Full moon in maximum Hebrew time fell AD. 1825 April 4.073,843 and at the begin

ning of the century April 4.1609, and Table C shows April 4.14 in AD. 1806. But the actual date in Hebrew time was April 3.574. Then NS. Table IV puts GN. 2 on Saturday April 2, and Easter on the actual date of the full moon of Nisan April 3d. (Notes 72, 75–80, 89, 91.)

AC. 2d Example. AD. 1903=GN. 4, which AC. Table IV puts at April 12. The actual date of full moon in Hebrew time was AD. 1903 April 12.592,228. And this being the third year after leap year, actual time is maximum time. But NS. Table IV puts GN. 4 on Saturday April 11, and NS. Easter on the day of the full moon of Nisan. (Notes 72, 75–80, 89, 91.)

AC. 3d Example. AD. 1845 mean full moon fell 3 hours before noon of Sunday March 23 at Jerusalem. AD. 1845=GN. 3, which NS. Table IV puts at March 22, and Easter on the day of full moon March 23. (Notes 73, 75–80.)

AC. 4th Example. For the Greek Easter. AD. 1864+5508; divided by the circle 19 leaves GN. AM. 19. To which add 3 in a circle of 19=GN. JP. 3, which AC. Table IV puts at Thursday March 24, but NS. Table IV puts at Tuesday March 22. Then full moon fell March 23.317,741. So that if March 23 had been Sunday, Easter would have fallen on the day of full moon if the Greeks had adopted NS. By the present Greek rules (AM.) in AD. 1864, the Greek Easter fell April 19 OS.=May 1st NS., five weeks after the Nicean Easter. And the full moon of Zif fell April 21.848,330 NS., as a supernumerary full moon between the Greek Easter and the vernal equinox. (Notes 108–119.)

AC. NOTES.

CONTENTS.

HISTORICAL BASIS OF AC.

Paschal Canons.

(**1**). These formed the solar portion of the Alexandrian Canon, which is herein termed the Nicean Calendar (NC.), and were as follows: "1st. That the 21st day of March shall be accounted the vernal equinox. 2d. That the full moon happening upon or next after the 21st day of March shall be taken for the full moon of Nisan. 3d. That the Lord's day next following shall be Easter day. 4th. But if full moon happen upon a Sunday, Easter shall be the Sunday after" (Wheatly, p. 36). (1–16, 32, 41–46, 75–80, 94–101).

(**2**). These Canons are at present given in the Anglican Prayer Books, thus: "Easter day....is always the first Sunday after the full moon, which happens upon or next after the 21st day of March; and if full moon happen upon a Sunday, Easter day is the Sunday after." (1.)

(**3**). These Canons originated thus: The Evangelists show that the Crucifixion occurred on the 14th Nisan. (HC. Notes 77–83.) The "Quartodecimans" of Asia held Easter on the 14th day of Nisan, the anniversary of the Crucifixion,

and upon any day of the week, until in AD. 314 the Council of Arles decided against this custom, and in AD. 325 the Council of Nicea confirmed this decision, and ordered that Easter should not be held on the 14th day of Nisan, but on the Sunday next thereafter (Brady, V. 1, p. 294), "Ne cum Judæis conveniamus" (Missal). (1, 77.)

(4). This was a strictly astronomic date at the time of the Crucifixion, and depended upon the actual appearance of new moon. The Egyptians were the most skillful astronomers. "The Patriarch of Alexandria was commissioned to announce the time of Easter" (Neale, p. 113; Seabury, p. 77). "The Fathers of the century after the Council of Nicea, ordered the new and full moons to be found by the cycle of the moons consisting of 19 years" (Wheatly, pp. 36, 37). (6–8, 94–101.)

(5). This is the Alexandrian Cycle (NC. GN. in JE. Table), of which a part is given in Table A. It gives the mean dates of 235 conjunctions in each 19 years about AD. 325 in Hebrew time counted from 6 hours before midnight at Jerusalem. This formed the lunar portion of the "Alexandrian Canon." The solar portion was the "Paschal Canons," which directed which of these new moons should be used as the new moon of Nisan; from which to determine the date of Easter. And about AD. 325, March 21, of the Paschal Canons, was the date of the vernal equinox in each third year after bissextile, while the actual date in AD. 325 was March 20. (1, 14–16, 81–87, 94–101.)

Mosaic Rule.

(6). All authors agree, that during the second temple, the beginning of Nisan depended upon the actual appearance of new moon. But no known author defines at which end of this day, did Nisan begin, except Maimonides, and he and the Talmud are the standard Hebrew authorities.

(7). Maimonides (Col. 236) says: "Each month the moon is occulted and does not appear for about two days, more or less, to wit, at the conjunction with the sun before the end of the month. Then again it is seen in the evening in the West. But in the night in which the moon first appears after its occultation, from that the beginning of the month is counted." And (Col. 234) he believes this to be the Mosaic rule. (75–80.)

(8). Now: This states distinctly, that under the rule which prevailed at the time of the Crucifixion, "conjunction with the sun (was) *before* the end of the month." And that the month did not begin until after the appearance of the new moon. Newton and Smyth say, that the moon has never been seen earlier than 18 hours after conjunction. Consequently Nisan could not begin earlier than 18 hours after conjunction. And full moon is 14 days 18 hours after conjunction. Consequently the 14th day of Nisan was the day of full moon, and full moon could not possibly fall later than the end of the 14th Nisan. And the full moon of Nisan was the full moon which fell on, or next, after the vernal equinox. And about AD. 325 the 21st March was the latest date of the equinox. Hence the Paschal Canons, by forbidding Easter to be held on the day of full moon on or next after March 21 represented the Nicean rule, that Easter must not be held on the 14th Nisan. (1, 14–16, 72, 73, 75–80.)

(9). Also: Josephus was in Jerusalem in AD. 70, at the time of the destruction of the second temple. As a contemporary historian he describes what then occurred.

In his Antiquities, Book 2, Chap. 4, Sec. 6, and B. 3, C. 10, S. 5, and B. 11, C. 4, S. 8, and Wars, B. 5, C. 3, S. 1, he shows that what Moses directs to be done on the 14th day of the First Month (Ex. xii. 3–6) was done on the 14th Xanthicus, which Scaliger says was the Macedonian name for the Roman month April. And mean full moon fell at Jerusalem AD. 70, at 3 hours 37 minutes before noon of April 14. This historic fact, proves that the day of full moon was the 14th Nisan at the last sacrifices in the temple, and this agrees with the Mosaic rule stated by Maimonides. (7, 10, 11, 75–80.) (HC. Note 76, 178.)

(**10**). Also: The lunar dates by the present Hebrew Calendar, are so wonderfully accurate that they are assumed to be perfect, when used to prove the necessity of modifying the present rules to determine ancient dates (HCM.). Its author, and the time of its construction, are unknown. Its solar and lunar dates indicate that it is based on astronomic facts in AD. 607, when it agrees almost precisely with the Mosaic rule if properly interpreted. The author doubtless applied his rules to this most important date, when the last sacrifices were offered in the temple and the Hebrews ceased to be a nation. Then if the Hebrew day be counted by the Mosaic rule as beginning in the evening *after* conjunction, it makes the 14th day of Nisan fall on the day of full moon April 14, AD. 70. (9, 75–80.) (HC. Notes 22–26.)

(**11**). Hence, the Paschal Canons and their history, and the Mosaic rule, and the historic fact as to the last sacrifices in the temple, and the present Hebrew calendar, when interpreted in accordance with the ancient rule, all concur in proving that the date of the full moon of Nisan is the forbidden 14th Nisan. (1, 7–10, 75–80.)

Astronomic Basis of AC.

(**12**). MDT. and MDB. (Appendix) are in precise accordance with a mean year of 365.242,216 days, and a mean lunation of 29.530,589 days. And these are proved to be correct by many historic dates, including the earliest recorded solar date 2,300 years before AD. 1869 (MD. 4th Ex.), and the earliest recorded lunar date 2,600 years before AD. 1880 (MD. 2d Ex.) (35). The mean year of 365.242,216 is the estimate in GNA. since 1857. Previously it was Bessel's estimate 365.242,217. Delambre gives 365.242,256; Biot, 365.242,245. Brady (p. 50) says that Newton's estimate was 365.242,326, and that Dr. Kelly, who made some improvements in GNA., gives 365.242,222; Jarvis (p. 103) uses 365.242,234; Delambre (Vol. 1, p. 8) says that the authors of NS. thought that 365.242,546,2 was near enough for several centuries. They do subtract 0.0075 from the Julian year of 365.25, and that makes 365.242,500. (33–35.)

(**13**). Then, by MDT., find the minimum standard date of the equinox, or of the moon, and add JCC. for calendar date. Then verify the calculation by finding the same date precisely by MDB. Then to minimum standard date add 1.098,148 for maximum Hebrew date. That is, add 0.098,148 for longitude of Jerusalem, 2 hours..21 m..20 sec. east of Greenwich; +0.25 to count in Hebrew time from 6 hours before midnight; +0.75 for maximum time, or actual time in the third year after bissextile. Thus:

(**14**). In AD. 325 the vernal equinox fell March 20.332,586 in minimum standard time. Add 0.25 JCC.=March 20.582,586 actual standard time as found by MDB. Then to March 20.332,586 add 1.098,148=March 21.430,734 in maximum Hebrew time, or actual Hebrew time in each third year after bissextile about AD. 325, when

the recession of 0.007,784 day per year is excluded. But the actual time in AD. 325 was March 20.680,734, when counted from midnight at Jerusalem, or March 20.930,734, if counted from 6 hours before midnight at Jerusalem. (15, 16, 31–35, 86.)

(**15**). *Contra.* All the following assert or imply that the actual date of the vernal equinox in AD. 325 was March 21, without stating in what kind of time, viz.: Long (1255) says: "The equinox in common years near AD. 325 was March 21." And Montucla (Vol. 1, p. 582) says: "At the time of the Council of Nicea, the vernal equinox fell March 21." And Renwick (Vol. 2, p. 201) says: "The Council of Nice, in the year AD. 325, finding the equinox on March 21." And Rees (Calendar) says: "Sosigenes, in the reign of Julius Cæsar, had observed the vernal equinox on March 25. At the Council of Nice it was fixed at March 21. In 1582 it was brought back to March 21." And Adams (Roman year) says: "Equinox fell AD. 325, March 21." And the Missal (De festibus mobilibus) says: "Since, according to the decree of the Nicean Council, Easter must be celebrated on Sunday next after the 14th day of the first month, to wit, that which among the Hebrews is called the first month, of which the 14th of the moon falls on or next after the vernal equinox, which falls on the 21st of March." And to the same effect, see Wheatly (pp. 35–38), and Seabury (pp. 105, 110, 118). But Seabury (p. 190) quotes the Act of Parliament of 1751, as "On or about the 21st day of March." And Wheatly (p. 37) says: "For want of better skill in astronomy, the Paschal Canons confined the equinox to March 21." (1, 14, 31–35.)

(**16**). *Now.* The "skill in astronomy" is proved by giving the canon, "That the 21st day of March shall be *accounted* the vernal equinox." Had March 20, the actual date in AD. 325, been given, then would Easter have fallen on the forbidden 14th Nisan in each third year after bissextile, when full moon fell on Sunday, March 21. (1, 14, 31–35.)

CONSTRUCTION OF AC. TABLES I. AND II.

AC. Table I.

(**17**). Count Jan. 54 and 83 (Feb. 23 and March 24) as the limits of the first month of the lunar year, and GN. 11, Jan. 54 the first GN. in the year. Then to Jan. 54 continue to add, alternately, 30 and 29 days in a circle of 365 day, until the date falls within the limits. Then and in all cases begin the first month with 30 days and continue the alternation 30 and 29 until the date falls within the limits. And at each addition mark the same GN. until the date exceeds Jan. 365, and then add one year to the GN. when 365 is subtracted from the date—except, make the year GN. 19 366 days, and when the date exceeds Jan. 366, then subtract 366 to find the date of GN. 1. (25, 26.)

(**18**). This extends through the whole cycle, the Egyptian rules, as shown in Table A from GN. 16, Feb. 6, to GN. 5, April 7. AC. Rule 2 shows that the small GN. from 1 to 8 fall half a day too early, and the large GN. from 9 to 19 fall half a day too late for the average. Hence, when a small GN. begins the series, the last of the series will fall on the 30th day. But when a large GN. begins the series, the last of the series will fall on the 29th day. Hence, the large GN. 11 is made the first GN. of the first month of the lunar year at Jan. 54, so that in the alternation the short months of 29 days may contain the whole series. (55, 66–70, 81.)

(**19**). Also: The alternation of 30 and 29 days interrupts the regular succession of dates at each junction where the long months begin, as shown by a large GN. following one day after a small GN., as at April 23, June 21, Aug. 19, Oct. 17, Dec. 15. Also at Feb. 12 when GN. 12 is only one day later than GN. 4. But these are in the same lunar years as the previous GN. 11 and 3, which have one year additional to make them count in Julian years. (66–70, 81.)

(**20**). Now. The standard is GN. 3, and as the Index in AC. Table II. advances from 0 to 29, GN. 3 will advance from March 21 to April 19. And when GN. 3 falls on March 21, the irregularity at the junction will fall at GN. 11 April 21. And as GN. 3 advances to April 19, this junction will at the same time be carried forward, and at the same time the previous junction, which now stands at GN. 12, Feb. 12, will be carried forward to March 11. Hence, in no case during the Great Lunar cycle of 6501 years will the regularity of the dates of the 19 full moons of Nisan, on or between March 21 and April 19, be interrupted by the junction of the long with the short months. (66–70.)

(**21**). *Contra.* In the Egyptian cycle (81) the junction falls at GN. 16, April 6, and the addition of 13 days if continued would have brought this junction to GN. 16, April 19. This junction of GN. 16, April 6 happened to fall at this date because this Egyptian cycle pays no regard to the solar dates of the new moons of Nisan. But AC. Table I. is prepared for Hebrew dates, and when a small GN. falls on March 21, or a large GN. falls on March 22, then the regular date of the last of the series falls on April 19. And AC. leaves them at the regular dates. But Contra, Rule 8 retracts all GN. which regularly fall on April 19 to April 18. And if this be a small GN. from 1 to 8, it regularly falls only one day after the large GN. from 12 to 19. Then, to prevent two GN. falling on the same day, the large GN. from 12 to 19 is retracted from April 18 to April 17. And these retractions are produced in the Roman mode by increasing the epacts as shown in Table A (81), and in the Anglican mode, by retracting the dates in NS. Table III. (66–70.)

(**22**). *Also*, as to AC. Table I. All cycles of 19 years necessarily have 12 common years of 12 months and 7 Embolismic years of 13 months. Two of such cycles are strictly astronomic. MDT. counts 235 mean lunations of 29.530,589 days. The present Hebrew Calendar (HC.) counts 235 lunations of 29 days..12 hours 793 scruples, of which 1080=one hour, and this lunation is less than half a second longer than 29.530,589 days. The Metonic Cycle (OE.) counts nothing less than whole days, but it counts every day as one. The Egyptian Cycle counts nothing less than whole days and makes no difference for the extra day in a leap year. But, while the Hebrew Calendar is the most occult and the most complicated of all calendars, the Egyptian rules are the most simple.

(**23**). The Egyptian cycle is counted in years of 365 days. And 19 years of 365 days=3935 days. Then 235 months alternately 30 and 29 days would count 6933 days. AC. Table I. always begins the year with a month of 30 days, so that the 7 embolismic months have 30 days each. Then the cycle contains 228 months alternately 30 and 29 days, and 7 embolismic months of 30 days=3936 days. Then at the end of the cycle, AC. Table I. adds one intercalary day to the 19 years of 365 days to make the days in the years 3936, the same as the days in the months. Then when these years of 365 days are expanded to 365.25 by being counted in Julian time, the average length of the month is almost precisely the length of a mean lunation.

AC. NOTES.

(**24**). In AC. Table I. each of these 7 embolismic months of 30 days, ends, and a second month of 30 days begins, at each of the first 7 GN. of the series, from Feb. 23 to March 4, viz., at the beginning of GN. 11, 19, 8, 16, 5, 13, 2. So that there is a regular succession of dates by AC. Rules 2 to 4 from Feb. 12 to April 22, and thereafter from GN. 11, for two months in succession throughout the cycle, without the irregularities at the junctions.

(**25**). *Contra.* In the Alexandrian Cycle (81) the same rules apply to the part from Feb. 6 to April 5. But not to the whole of the cycle (JE. Table). The 7 extra months of 30 days begin at these dates: GN. 3, Jan. 1, GN. 5, Sept. 2; GN. 8, March 6, GN. 11, Jan. 3, GN. 13, Dec. 31, GN. 16, Sept. 1; GN. 19, March 5. But the greatest difference is in the year GN. 19 in which the dates of the months run thus: Jan. 5;+29=34;+30=64;+30 again=94;+29=123;+30=153;+29=182;+29 again=211;+29 for the third time=240;+30=270+29=299:+30=329;+29=358;+30=388. Then subtract 365 leaves Jan. 23 for GN. 1.

(**26**). This makes it appear as if the 235 months are contained in 19 years of 365 days without the intercalary of AC. Table I. But this intercalary is contained in this irregular alternation. This is proved by AC. Rules 3, 4, 5, in which the intercalary must be included to find the dates in the Alexandrian cycle, on and between Feb. 6 and April 5, with either of the GN. and its date, used as the standard. (53, 55–65.)

(**27**). *AC. Table* I. puts GN. 3 at March 23 or two days after March 21. This would be for Index 2, and for ecclesiastical dates all the GN. must be taken one day later than in the table to agree with AC. Index 3 from the beginning of this century to March 1st AD. 2100, so that in all cases the latest possible date in Hebrew time shall be given.

(**28**). But AC. Table I., for average standard dates sometimes makes the dates too late and sometimes too early for the actual dates. Thus: take the four years near the middle of this century (of which the *Nautical Almanacs* are at hand) and in AD. 1855 the average actual full moon fell at 11 hours after the beginning of the table date. In 1856 at 9 hours before the beginning of the table date. In 1857 at 7 hours before. In 1858 at 2 hours after. The average of the four years is three hours before the beginning of the table date. MDE. Table (A) gives the precise mean date during the present cycle. This can be compared with AC. Table I. (MDE. 3d Ex.)

(**29**). *As to the Epacts in AC. Table I.* The Missal gives the following: "Table of Epacts corresponding with the Golden Numbers, from the Ides of October in the year of correction 1582 (first subtracting ten days) to the year 1700 exclusive."

GN......	6	7	8	9	10	11	12	13	14	15	16	17	18	19	1	2	3	4	5
Epacts...	26	7	18	29	10	21	2	13	24	5	16	27	8	19	1	12	23	4	15

And a second table from 1700 to 1900 exclusive, thus:

GN.......	10	11	12	13	14	15	16	17	18	19	1	2	3	4	5	6	7	8	9
Epacts....	9	20	1	12	23	4	15	26	7	18	*	11	22	3	14	25	6	17	28

Now: Index 0, puts all the GN. two days earlier than in AC. Table I., and brings them opposite to the same Epacts as the first table in the Missal. And Index 1 puts all the GN. one day earlier than in AC. Table I., and brings them opposite to the same Epacts as in the second table in the Missal. As the GN. now stand in AC. Table 1, they represent the second change corresponding with Index 2. And thus as GN. 3, advances from March 21 to April 19, the 30 changes of Epacts will be given to find ecclesiastical dates in the Roman mode, by NS. Table VII.—except that AC. obliterates the NS. Retractions.

(30). In a part of this work which was printed in 1874, a column of Epacts was added to NS. Table III., with these remarks: "Table III. is the Anglican Table III, with the addition of the column of Epacts, to be used with Table VII. These are found, by adding 13 days to the dates of the same Epacts for the Paschal New Moons in the Missal. This column, with the assistance of the Anglican Tables II. and III., will for all time show the 30 changes of Epacts during each Great Cycle. The Missal gives two tables and 52 lines of printing for the single change of Epacts from AD. 1582 to 1899, and says: 'De qua re plura invenies in libro novœ rationis restituendi Kalendarii Romani,' but does not give the name of the 'book.' Delambre (Vol. 1, p. 18) says that Clavius gives 217 combinations. Long (1266–8) gives three tables here represented by Indexes 0, 1, 2; and says that Clavius gives 30 series of Epacts, and tables up to AD. 303, 300. See Jarvis (p. 107); Wheatly (pp. 37-47); Seabury (p. 201); Rees (Cycle, Number)." (61–63, 120–130.)

AC. NOTES.

(31.) AC. TABLE II.—Construction.

Bissextiles.	Years AD.	AC. SC.	Vernal Equinox. Max. Hebrew, Jan. OS. — 0.7784 per century.	Full Moon of GN. 3. Days after Equinox. + 0.454,268,42 per century.	AC. Indexes. + Mar. 21 AC.=date AC. of Full Moon of GN. 3 in Max. Hebrew time.
	325	0	80.4307	25.1560	25.5867
	1288	8	72.9347	0.0000	0.9347
B	1600	10	70.5061	1.4173	1.9234
	1700	11	69.7227	1.8716	2.5943
	1800	12	68.9493	2.3259	3.2752
	1900	13	68.1709	2.7801	3.9510
B	2000	13	67.3925	3.2344	3.6269
	2100	14	66.6141	3.6887	4.3028
	2200	15	65.8357	4.1429	4.9786
	2300	16	65.0573	4.5972	5.6545
B	2400	16	64.2789	5.0515	5.3304
	2500	17	63.5005	5.5057	6.0062
	2600	18	62.7221	5.9600	6.6821
	2700	19	61.9437	6.4143	7.3580
B	2800	19	61.1653	6.8685	7.0338
	2900	20	60.3869	7.3228	7.7097
	3000	21	59.6085	7.7771	8.3856
	3100	22	58.8301	8.2313	9.0614
B	3200	22	58.0517	8.6856	8.7373
	3300	23	57.2733	9.1399	9.4132
	3400	24	56.4949	9.5941	10.0890
	3500	25	55.7165	10.0484	10.7649
B	3600	25	54.9381	10.5027	10.4408
	3700	26	54.1597	10.9570	11.1167
	3800	27	53.3813	11.4112	11.7925
	3900	28	52.6029	11.8655	12.4684
B	4000	28	51.9245	12.3198	12.2443
	4100	29	51.0461	12.7740	12.8201
	4200	30	50.2677	13.2283	13.4960
	4300	31	49.4893	13.6826	14.1719
B	4400	31	48.7109	14.1368	13.8477
	4500	32	47.9325	14.5911	14.5236
	4600	33	47.1541	15.0454	15.1995
	4700	34	46.3757	15.4996	15.8753
B	4800	34	45.5973	15.9539	15.5512
	4900	35	44.8189	16.4082	16.2271

Bissextiles.	Years AD.	AC. SC.	Vernal Equinox. Max. Hebrew, Jan. OS. — 0.7784 per century.	Full Moon of GN. 3. Days after Equinox. + 0.454,268,42 per century.	AC. Indexes. + March 21 = date AC. of Full Moon of GN. 3 Max. Hebrew time.
	5000	36	44.0405	16.8624	16.9029
	5100	37	43.2621	17.3167	17.5792
B	5200	37	42.4837	17.7710	17.2547
	5300	38	41.7053	18.2252	17.9305
	5400	39	40.9269	18.6795	18.6064
	5500	40	40.1485	19.1338	19.2823
B	5600	40	39.3701	19.5881	18.9582
	5700	41	38.5917	20.0423	19.6340
	5800	42	37.8133	20.4966	20.3099
	5900	43	37.0349	20.9509	20.9878
*	6000	44	36.2565	21.4151	21.6716
	6100	45	35.4781	21.8594	22.3375
	6200	46	34.6997	22.3137	23.0134
	6300	47	33.9213	22.7679	23.6892
B	6400	47	33.1429	23.2222	23.3649
	6500	48	32.3645	23.6765	24.0410
	6600	49	31.5861	24.1307	24.7168
	6700	50	30.8077	24.5850	25.3927
B	6800	50	30.0293	25.0393	25.0686
	6900	51	29.2509	25.4935	25.7444
	7000	52	28.4725	25.9478	26.4203
	7100	53	27.6941	26.4021	27.0962
B	7200	53	26.9157	26.8563	26.7720
	7300	54	26.1373	27.3106	27.4479
	7400	55	25.3589	27 7649	28.1238
	7500	56	24.5805	28.2192	28.7997
B	7600	56	23.8021	28.6734	28.4755
	7700	57	23.0237	29.1277	29.1514
*	7789	58	22.3309	0.0014	0.3323
B	7800	58	22.2453	0.0514	0.2967
	7900	59	21.4669	0.5056	0.9725
B	8000	59	20.6885	0.9599	0.6484
	8100	60	19.9101	1.4142	1.3243
	8200	61	19.1317	1.8684	2.0001
	8300	62	18.3533	2.3227	2.6760
B	8400	62	17.5749	2.7770	2.3519
	8500	63	16.7965	3.2312	3.0277

AC. Table II. Explained.

(32). *As to the date of the equinox* (31). The vernal equinox fell AD. 325 Jan. 79.332,586, and AD. 1600, Jan. 69.407,986 in minimum standard time. Then add 1.098,148 makes AD. 325 Jan. 80.430,734, and AD. 1600 Jan. 70.506,134 in maximum Hebrew time. Then continue to subtract 0.7784 day per century for the dates of the equinox in the centurial years, for the difference between 100 Julian years of 365.25 days and 100 equinoxial years of 365.242,216 days. (12–16, 33–35.)

(**33**). NS. SC. subtracts 0.75 day from 100 Julian years, and this makes the NS. year=365.242,500, or a difference of one day in 3521 years. (12, 35.)

(**34**). *Contra.* Delambre says that the error is one day in 3600 years. This makes the equinoxial year 365.242,222 days. (12, 33, 35.)

(**35**). *Now.* The Greenwich Nautical Almanac assumed 365.242,217 up to 1856, when (p. 581) it says: "The equinoxial year has been assumed, according to Bessel (*Conn. des Temps*, 1831, Additions, p. 154), equal to 365.242,217 mean solar days." But in 1857 the estimate was changed to 365.242,216 days. And this agrees with the earliest solar date on record, 2300 years before 1869 (MD. 4th Ex.). (12.)

(**36**). *As to moon later than equinox in AC. Table II.* (31). 19 equinoxial years of 365.242,216 days=6939.602,104 days. And 235 lunations of 29.530,589 days =6939.688,415 days. The difference 0.086,311 divided by 19 years gives 0.004,542,684,2 day per year, that the moon represented by any GN., advances in equinoxial date. And this into 29.530,589 gives 6500.692 years for it to advance a full lunation after the vernal equinox, and to become the full moon of Zif, when the full moon one lunation earlier becomes the full moon of Nisan. (39, 40.)

(**37**). The standard is the full moon of GN. 3. And AD. 1883=GN. 3 when the full moon fell 2.702,894 days after the vernal equinox. This divided by the rate per year=595 years. And this from AD. 1883 leaves AD. 1288 when the moon coincided with the equinox. Then for the fractions. In AD. 1275=GN. 3 the moon fell 0.059,058 before the equinox. In 13 years it advanced in equinoxial date 0.059,055. Hence AD. 1288 the full moon of GN. 3 at its regular advance and assuming that this was its year, fell 0.000,003 before the equinox. (101.) (HC. 65.)

(**38**). Also AD. 1598=GN. 3, full moon fell 1.408,229 after the equinox. Add 0.009,085 its advance for two years=1.417,314 day after the equinox in AD. 1600. To this continue to add 0.454,268,42 for the advance per century. (32, 36.)

(**39**). The next great cycle will begin 6500.692 years after AD. 1288=AD. 7789. AD. 7773=GN. 3, when full moon falls 29.459,304 after the equinox. Add the advance for 16 years, makes 29.531,987 that the present moon will fall later than the equinox in AD. 7789. Subtract a lunation, leaves 0.001398, that the next full moon of Nisan in GN. 3 will be later than the equinox in AD. 7789. Hence AD. 7789 will be the beginning of the next Great Lunar Cycle. Then add 11 years advance makes the next standard moon of Nisan fall 0.051,367 after the equinox in AD. 7800. Then as before continue to add 0.454,268,42 per century. (32, 36.)

(**40**). *Contra.* NS. Table II. makes the next Great Lunar Cycle begin in AD. 8500, when AC. Table II. makes the next moon fall 3.2312 days after the equinox. And this is in absolute time, independent of artificial time. (31.)

As to AC. SC. in AC. Table II.

(**41**). As in the Julian Calendar (OS.), count every year AD. as a bissextile which leaves no remainder when divided by 4, except the centurial years. And then omit the intercalaries in every centurial year, of which the centuries leave a remainder when divided by 4, with these exceptions. Omit the intercalary in AD. 6000 and in AD. 7788, and insert it in AD. 7800. Then, beginning with 10 days AC. SC. in AD. 1600, add one day for each intercalary OS. that is omitted.

(**42**). This makes AC. SC. the same as NS. SC. until AD. 6000, and thereafter one day more, and removes the NS. intercalary from AD. 7788 to AD. 7800. And for these reasons. (71.)

(43). To make the date of the vernal equinox fall invariably on March 21 of the Paschal Canons in the centurial year, subtract the whole number of its date OS. from Jan. 80. Thus, in AD. 1600, Jan. 70 from Jan. 80=10 AC. SC., and the equinox falls March 21. 5061, AC. But before the end of the century it will fall on March 20, because with every fourth year as a bissextile its date recedes 0.7784 per century. And hence, if the actual date be not later than March 21 in the beginning of the century, it cannot become so during the century. (1, 32–36.)

(44). Again. With the present system of omitting three intercalaries in four centuries, it is not practicable to make the equinox always fall on March 21 at the beginning of the century. When AC. SC., added to the date OS. of the equinox makes Jan. 79, it falls on March 20, as in 4000, 4400, 4800, 4900, 5200, 5300, 5400, 5600, 5700, 5800. And it would do so in AD. 6000, if the intercalary of NS. were retained. Before 6000 there can be no omission of the NS. intercalary without occasionally making the equinox fall on March 22, and thus bringing Easter on the forbidden 14th Nisan. But by retaining the intercalary in 6000, the date would then and thereafter vibrate between March 19 and March 20, and never fall as late as March 21. This would never bring Easter on the forbidden 14th Nisan, but it would cause unnecessary postponements.

(45). Then the departures from the system, by omitting the intercalary at AD. 7788, is necessary to make the date March 21 on the beginning of the next great lunar cycle, so that the Index may be zero. Then it is inserted irregularly in AD. 7800, to prevent the date thereafter exceeding March 21.

(46). There is a defect in AD. 1900, when the actual date of the equinox will be March 22. 1709, AC. or NS. But in 22 years the date will recede to March 21.

As to the Indexes in AC. Table II. (31).

(47). Add together the day of Jan. OS. of the date of the vernal equinox and fraction, and the days and fraction of the full moon after the equinox, and the days of AC. SC. and from the sum subtract Jan. 80, and the remainder will be the AC. Index.

(48). *Contra.* NS. Table II. gives the indexes differing from AC. Indexes throughout the table. It makes the next great lunar cycle begin in AD. 8500, when AC. makes the next full moon of GN. 3 fall 3.2312 days after the equinox. And in the beginning of the present century, AD.=1807, GN. 3, its Index makes the full moon of Nisan fall on March 22, while AC. Index 3 makes it fall on March 24.

(49). *Now.* AC. Index and fraction added to March 21 AC., gives the date of the full moon of Nisan in the year GN. 3 (if that be the centurial year) in maximum Hebrew time, in precise accordance with a mean year of 365.242,216 days, and a mean lunation of 29.530,589 days. AC. SC. does not always make the equinox fall on March 21. But that does not affect the accuracy of the lunar date, when the Index is added to March 21 AC., since every day added to AC. SC. adds one day to the Index and one day to the date of the full moon, which is the sum of the date of the equinox of the moon after the equinox. (12.)

(50). Then in AD. 1807=GN. 3, full moon fell Jan. 70.154,348 in minimum standard time OS. Add 1.098,148 for maximum Hebrew and 12 days NS. SC., or AC. SC., makes March 24.252,496 AC. or NS. And 1807 is the third year after leap year, when the maximum and the actual dates are the same. Then add 7

years recession since AD. 1800 at the rate of 0.003,241 per year makes the date in AD. 1800 March 24.275,183. And in AD. 1800 the Index 3.2752 added to March 21 makes March 24.2752, which is the same as found by direct calculation of the date of full moon. (32, 36.)

(**51**). And Table C shows that from AD. 1800 to 1818, NS. uniformly makes the dates earlier than the astronomic dates, so as to make Easter fall on the forbidden day of full moon when that falls on Sunday, as shown in AC. 1st, 2d, and 3d Ex. (72, 73, 89.)

AC. Rules Explained.

(**52**). *As to AC. Rule* 1. In AC. Table I. the dates are one day less than given by AC. Rules 2, 3, 4, in order to reduce maximum Hebrew time in the beginning of the century to average standard time in the middle of the century. Then AC. Index gives the latest date upon which the full moon can fall when given in terms of the Egyptian rules. The comparison of the dates given by these rules with the astronomic dates in maximum Hebrew time for the 20 years from AD. 1800 to 1819 in Table C shows that the Egyptian dates of GN. AC. average 0.29 day more than the astronomic dates. Therefore, subtract 0.29 for the average. And subtract 0.162 for the recession for 50 years. And subtract 1.098,148 to reduce maximum Hebrew to minimum standard date. These make 1.550 to be subtracted for minimum standard date in the middle of the century. Then to minimum date add 0.50 JCC. for medium date in the second year after leap year leaves 1.05 to be sub tracted, or 0.05 more than by AC. Rule 1. (28, 89.)

(**53**). In general terms, AC. Rule 1 directs that all the GN. shall be kept at the same distance from the standard GN. 3. This is now at March 23. And being always one day earlier than the full moon of Nisan, its earliest date will be March 20 and latest April 18. Then each GN. in succession will fall one day later than Dec. 31=Jan. 1, with one year added to the GN., until GN. 19 falls one day later than Dec. 31. But at the end of the year GN. 19 there is an intercalary, so that GN. 19 must remain at Dec. 31 until GN. 11 falls on Dec. 31, and then GN. 19 becomes GN. 1 Jan. 1. (26.)

(**54**). The main object of this table is to illustrate the Egyptian rules, which have governed the whole Christian Church since their adoption in the century after the Council of Nicea in AD. 325. The precise date of full moon for all time can be easily found by MDT. or MDB. But this table, without calculation (except to find GN. of the year by AC. Rule 1), will for all time give a near approximation to those dates. In the north of Europe the Alexandrian cycle (JE. Table) is indicated by notches cut in walking-sticks, which are called Clogs, Runstocks, Rumstaffs, Reinstocks, Runici, Primsteries, Scipiones, Baculi, Annales, Staves, Stakes (Brady, p. 47; Hone's Preface; Rees' Runic Staff.) (18, 28.) (GND. Note 4.)

(**55**). *As to AC. Rule* 2. Ninety-nine lunations are about a day and a half more than 8 Julian years. Hence to count by half days the rule would be: Add 8 in a circle of 19 to the GN. and a day and a half to the date. But to count by whole days, the Egyptian rules make the small GN. from 1 to 8 to be half a day earlier, and the large GN. from 9 to 19 to be half a day later than the average. Hence 30 days are required to contain the series if it begin with a small GN., but 29 days if it begin with a large GN. (18, 66–70.)

(**56**). Also, with any standard GN. and date, this rule will give every date in AC. Table I., with this proviso: When passing the junction, subtract one day

from the date, so as to bring the large GN. at one day after the small GN., as at Feb. 12, April 23, June 21, Aug. 19, Oct. 17, Dec. 15. (18–26, 66–70.)

(**57**). *As to AC. Rule* 3. The years of construction of AC. Table I. are 365 days each, excepting GN. 19, which with the intercalary is 366 days. Then a common year of 12 months alternately 30 and 29 days=354 days. Hence each year of 12 months will recede 11 days, except GN. 19 will recede 12 days. And since this falls in the next year, one year is added to the GN. Then if these 12 months do not come within the limits, the year is embolismic, and 30 days are added, because the 13th month always contains 30 days. (17, 23–26.)

(**58**). And this rule will give every date in AC. Table I., provided that when the recession carries the date past the junction from a long month into a short month, one day must be added to bring the small GN. at the end of the short month, one day before the large GN. at the beginning of the long month. (19, 66–70.)

(**59**). *As to AC. Rule* 4. The key date is the zero of the cycle, and one day less than the date of GN. 19, so as to omit the intercalary. Or it is an epact more than the date of GN. 1. Then multiply any GN. by 11 to find how many days the date has receded. And divide by 30 to find how many days the embolismic months of 30 days have added, and the remainder is the recession from zero, which subtracted from the key date, gives the date of that GN. (17, 23–26, 57.) (MDC. Rule 1.)

(**60**). And the key date for any series of GN. in AC. Table I., can be thus found. Multiply any GN. by 11; divide P by 30; add R to the date of that GN., and S= the key date—provided as before, if the key date be obtained from a GN. on one side of the junction, and the date of the GN. fall on the other, then if the date fall in the short month one day must be added, but if in the long month, one day must be subtracted to bring the large GN. at the beginning of the long month only one day after the small GN. at the end of the short month. (18, 19, 66–70.)

(**61**). *As to AC. Rule* 5. Epacts are actual dates, in the reverse order. The key epact is the zero of the cycle as the key date is the zero of the cycle. Both fall at the same date. And since Epacts increase as dates decrease, and as both omit the intercalary, so the key epact is one day more than the Epact of GN. 19, as the key date is one day less than the date of GN. 19. (17, 18, 30, 57, 81, 120–130.)

(**62**). And the key Epact can be thus found: Multiply any GN. by 11; divide P by 30; subtract R from the Epact of that GN., and R=key Epact.

(**63**). In each great lunar cycle of 6501 years, there are 30 series of 19 epacts or 570 Epacts of GN. to be found, as there are 570 dates of GN. to be found for the full moons of Nisan. These Epacts can all be found by AC. Rule 5, as the dates can all be found by AC. Rule 1 or 2, or 3, or 4. And the same rules modified by Contra Rule 8, will give all these epacts and dates, according to the Gregorian Calendar (NS.). And these rules, with AC. Rules 9 and 10, can easily be memorized. But for ordinary use it is more convenient to find the dates and the epacts from the Anglican Tables III. and IV., with the column of Epacts which were added by BA. in 1874. (30, 120–130.)

(**64**). *As to AC. Rule* 6. For AC. Table III. the figure O, placed under each GN., shows that when AC. Table II. makes the index to be O, then GN. 3 will fall on March 21, and from this standard the Egyptian rules AC. Rules 2 to 5, will give the date of each GN. that is opposite to O. And the date gives the Sunday letter and the Epact. Then for every day that GN. 3 advances, all the other GN. advance one day in a circle of 30 days on or between March 21 and April 19. Each

GN. in its turn will fall on April 19. The next advance of one day will make that moon fall on April 20, and thus become the full moon of Zif, at the same time that a full moon one lunation earlier in the same year will fall on March 21 and become the full moon of Nisan. This can be seen more distinctly in AC. Table I. And that table can be used instead of AC. Table III. But AC. Table III. in the Anglican form, is more convenient, for the single purpose of determining the date of Easter. And for that purpose, neither Table I. nor III., nor IV. is necessary either for AC., or for NS. The whole system of AC. is contained in AC. Table II. and Rule 1 or 2, or 3, or 4. And the whole system of NS. is contained in NS. Table II., with the same rules modified by Contra Rule 8. (66–70, 120–130.)

(**65**). *As to AC. Rule* 7. AC. Table IV. is an extract from AC. Table I. or III., for present use, to facilitate the calculation of Easter. NS. Table IV. is collated with AC. Table IV., to show the difference by examples.

(**66**). *As to Contra Rule* 8. The differences between AC. Table II., and NS. Table II., have been shown above (40, 48–51). Then as to NS. Retractions: AC. Rule 2 shows that the Egyptian rules put the dates of the small GN. from 1 to 8, half a day too early for the average, and the large GN. from 9 to 19 half a day later than the average. Hence when a small GN. begins the series, the last will fall on the 30th day. But when a large GN. begins the series the last will fall on the 29th day. Then NS. Table II. puts each GN. in its turn upon March 21 and 22. And when a small GN. falls on March 21 or a large GN. on March 22, the Egyptian date of the last of the series is April 19, and AC. leaves it there. (55–65.)

(**67**). But NS. retracts to April 18, all GN. which regularly fall on April 19. And if this be GN. 1 to 8, then GN. 12 to 19 falls regularly on April 18. And to prevent two GN. falling on the same day, GN. 12 to 19 is retracted to April 17, and the whole series is crowded into 28 days. (66–70.)

(**68**). Now in Table C, GN. AC., compared with the astronomic dates, show that when all the other dates are correct, the retraction of one day from the date of many of these GN., would make it one day less than the astronomic date of full moon, and thus bring Easter on the forbidden 14th Nisan when the full moon falls on Sunday. And the dates of GN. NS. being two days earlier than the dates of GN. AC., these dates, if retracted one day, would in all cases make the date two days before the date of full moon, and thus bring Easter on the forbidden 14th Nisan, when the dates fall on Saturday or Friday, and in many cases when they fall even on Thursday. (89.)

(**69**). The origin of these retractions is shown in Table A. The Alexandrian cycle gave the true dates of new moon about AD. 325 as nearly as practicable in the simple form of that calendar. But it paid no regard to the solar dates of the new moons of Nisan, and put the junction of the long month at GN. 16 April 6. Then Dionysius added 13 days to all the dates. This would have brought the irregularity at the junction at April 19. And April 19 would have been the beginning of the next lunar month. To avoid this irregularity, all GN. which regularly fall on April 19 are retracted to April 18. And this is founded upon the double error of omitting the earliest new moon of Nisan GN. 8 March 6, and then adding 13 days instead of 15 days for the dates of full moon as shown in Table B, where it is shown that if Dionysius had begun with GN. 8 March 6 and had added 15 days to the dates, his table would have given the true dates of the full moons of Nisan on and between March 21 and April 19, and the irregularity at the Junction would have fallen at GN. 16 April 21. (19, 20, 55, 81, 85.)

(70). Hence, these NS. Retractions to keep the dates within the "paschal limits" March 21 and April 18, are founded upon the double error of Dionysius, and are astronomically false, and bring Easter on the forbidden 14th Nisan. (19, 20, 55. 66–70, 81, 85.)

(71). *As to AC. Rules* 9, 10. Memorize Rules 9 and 10 to find the day of the week corresponding with any day of the month dated NS. And Rule 1, to find GN., and Rule 4 to find the date of GN. from the key date March 55 during this century (and March 56 from March 1 AD. 1900 to March 1 AD. 2100), and then find NS. Easter on Sunday next thereafter. And add one day to the date of GN. thus found for the average date of full moon, and for other dates of full moon add or subtract periods of 29½ days. But for full moon omit Contra Rule 8. (68.)

(72). *As to 1st and 2d Examples.* Lindo mentions these years in which Easter and the Passover fall on the same day. In both years it was the day of full moon which was forbidden by the Council of Nicea, while by the Mosaic rule, the Passover could not possibly fall on the day of full moon. And Table C shows that in the beginning of this century GN. NS. fell one and two days before the maximum Hebrew date of full moon, so as to bring Easter on the forbidden 14th Nisan when the date of GN. NS. fell on Friday or Saturday. (6–11, 77, 89.)

(73.) *As to 3d Example.* Professor De Morgan, Book of Almanacs, Introduction, p. viii., says: "When it happens that Easter Day falls *on* the day of real full moon, the apparent contradiction always makes a stir. On the last occasion, in 1845, I wrote an account of the Gregorian Calendar. . . . . (*Companion to the Almanac* for 1845)." (80 bis).

(74). *As to 4th Example.* This Greek Easter is referred to by Dr. Hill. This is GN. AM. 19. And Table C shows that the Greeks always hold Easter in the month Zif in each GN. AM. 19, 5, 8, 11, 16. (92, 108-119.)

GENERAL REMARKS AND CONTRADICTIONS

As to the 14th day of Nisan.

(75). The day of full moon, on or next after the vernal equinox, is accounted the 14th day of Nisan, upon which Easter must not be held according to the decision of the Council of Nicea. And this assumption is based upon the Paschal Canons and their history, and the Mosaic rule as stated by Maimonides, and the historic facts stated by Josephus, and the present Hebrew Calendar when interpreted by the Mosaic rule. (1–11.)

(76). *Contra.* Maimonides, Scaliger, Muler, Lindo, Nesselman, Slonenski, and Sekles, give rules to simplify the calculations by the present Hebrew Calendar (HC.) which is the most occult and most complicated of all calendars. But no known author except Maimonides, states the general principle of the present custom. He says (Col. 280): "If the date fall a moment before noon, the calendar is celebrated on that day." Calculation shows that this is the date of mean conjunction counted in Hebrew time with great accuracy. This makes Nisan begin *before* conjunction, and full moon to fall on the day of the Passover. And such is the present custom. And these were impossible under the Mosaic rule. (6–8.)

(77). No known author has objected to this interpretation. And Lindo says that his calculations have been examined by Airy the astronomer and found to be cor rect, and that his work has been approved by distinguished Rabbis in Great Britain.

And I suppose that his work is now the standard Hebrew authority in the English language. In his introduction he says: "The Council of Nice ordered that Easter should not be held on the first day of the Passover, 'ne videantur Judaizare.' But in 1825 and 1903 both fell on the same day." And AC. 1st and 2d Examples, show that both fell on the day of full moon. (1, 3, 72.)

(**78**.) And Table C shows that the Gregorian Calendar (NS.) frequently puts Easter on the day of full moon by dating GN. NS. one and two days before the date of full moon. And Aloysius, Lilius, Christoph Clavius, Petrus Cîaconius, and others (Anthon), spent ten years in framing that calendar. Long (1267). And Delambre (V. 1, p. 12) says: "I found the calendar better than its authors supposed." But Long (1267) says that Lilius explains the system and defends it from the attacks of Mœstlinus, Scaliger, and Vieta.

(**79**). And the Dionysian Cycle (OS.) governed the whole Christian Church for more than a thousand years (AD. 534 to 1582), and now governs the Greek Church in a Greek form. And Table B shows that it gave the dates of the GN. one and two days before the actual date of full moon, about AD. 325 (as NS. does at present). But no known author has made any objections on this score. On the contrary, NS. does the same. (85, 89.)

(**80**). *Now.* Notwithstanding this imposing array to the contrary, the reasons above given have been considered sufficient for the assumption that the ancient rule made the day of full moon to be the 14th Nisan, upon which the Passover could not possibly fall, when modifying the present rules (HC.) so as to give ancient Hebrew dates correctly (HCM.). And for the same reason, AC. Indexes prevent Easter falling on the same day as full moon. And for this purpose the dates are given in maximum time, which is the true time in the third year after leap year, and in Hebrew time counted from 6 hours before midnight at Jerusalem, since the 14th Nisan is a Hebrew date. And March 21 of the Paschal Canons is not the actual date of the vernal equinox in AD. 325, when it actually fell on March 20. But it was the date of the vernal equinox in each third year after bissextile about that time. (1–16, 75–80.) (HC. Note 178.)

(**80** bis). Blunt (p. 27) says: "The rule for finding Easter (founded on the decree of the Council of Nicæa) is not quite exactly stated. Instead of full moon, it ought to say, the 14th day of the calendar moon, whether that be the actual full moon or not. In some years (as in 1818 and 1845) the full moon and Easter coincide, and the rule then contradicts the tables." (72, 73.)

Also. Brady (p. 296) says, that in 1810 the moon was full at 3 A.M. on March 21; but according to lunar computation it was full on the 20th, and Easter was April 22, and not March 25. (72, 73.)

(81). TABLE A.

AD. Coincidence.	Alexandrian Cycle of AD 425. Roman Epacts of AD. 1582.						Dionysian Cycle of AD. 534 (OS.).		
	Month.	GN.	Epacts.	Month.	GN.	Epacts.	Month.	GN.	Ep. 1874.
6419	Feb. 6	16	23	Mar. 8	16	23	Mar. 21	16	23
6077	" 7	5	22	" 9	5	22	" 22	5	22
	" 8		21	" 10		21	" 23		21
5735	" 9	13	20	" 11	13	20	" 24	13	20
5393	" 10	2	19	" 12	2	19	" 25	2	19
	" 11		18	" 13		18	" 26		18
5051	" 12	10	17	" 14	10	17	" 27	10	17
	" 13		16	" 15		16	" 28		16
4709	" 14	18	15	" 16	18	15	" 29	18	15
4367	" 15	7	14	" 17	7	14	" 30	7	14
	" 16		13	" 18		13	" 31		13
4025	" 17	15	12	" 19	15	12	April 1	15	12
3683	" 18	4	11	" 20	4	11	" 2	4	11
	" 19		10	" 21		10	" 3		10
3340	" 20	12	9	" 22	12	9	" 4	12	9
2998	" 21	1	8	" 23	1	8	" 5	1	8
	" 22		7	" 24		7	" 6		7
2656	" 23	9	6	" 25	9	6	" 7	9	6
	" 24		5	" 26		5	" 8		5
2314	" 25	17	4	" 27	17	4	" 9	17	4
1972	" 26	6	3	" 28	6	3	" 10	6	3
	" 27		2	" 29		2	" 11		2
1630	" 28	14	1	" 30	14	1	" 12	14	1
1288	Mar. 1	3	*	" 31	3	*	" 13	3	*
	" 2		29	April 1		29	" 14		29
946	" 3	11	28	" 2	11	28	" 15	11	28
	" 4		27	" 3		27	" 16		27
604	" 5	19	26	" 4	19	26 (25)	" 17	19	26 (25)
261	" 6	8	25 (25)	" 5	8	25, 24	" 18	8	25, 24
	" 7		24	" 6	16	23			
				" 7	5	22			

(82). *Explanation.* The first column gives the years in which the opposite GN. of new moons from GN. 16 Feb. 6 to GN. 8 Mar. 6 become the new moons of Nisan, and GN. 16 Mar. 8 to GN. 8 April 5 become the new moons of Zif, and GN. 16 Mar. 21 to GN. 8 April 18 become the full moons of Zif. This is explained in MDT. Mosaic (A). (102–104.)

(83). GN. 16 Feb. 6 to GN. 5 April 7, with the epacts, are extracts from JE. Table. (69, 85, 89, 120–130.)

(84). The Dionysian cycle is given as a separate calendar (OS.). The epacts in this form were added in 1874 by B. A. See Tables B. and C. (29 30 102–104, 108–130.)

TABLE B.

Years AD.	GN. Alexandrian.	Alexandrian New.	Astronomic Full Max. Hebrew.	True Dates of GN.	GN. OS.	GN. AM.	Dionys. Dates.
330	8	6	21.703	21			
338	16	8	23.231	23	16	13	21
327	5	9	24.821	24	5	2	22
335	13	11	26.349	26	13	10	24
343	2	12	27.877	27	2	18	25
332	10	14	29.467	29	10	7	27
340	18	16	30.996	31	18	15	29
329	7	17	32.586	32	7	4	30
337	15	19	34.114	34	15	12	32
326	4	20	35.704	35	4	1	33
334	12	22	37.232	37	12	9	35
342	1	23	38.760	38	1	17	36
331	9	25	40.350	40	9	6	38
339	17	27	41.879	42	17	14	40
328	6	28	43.469	43	6	3	41
336	14	30	44.997	45	14	11	43
325	3	31	46.587	46	3	19	44
333	11	33	48.115	48	11	8	46
341	19	35	49.643	50	19	16	48
330	8	36	21.703	21	8	5	49

(85). *Explanation.* The 2d and 3d cols. give the GN. and dates of new moon in the day of March, as copied from the Alexandrian cycle in Table A. (81.)

(86). The 4th col. gives the astronomic dates of the full moon in the 19 years beginning AD. 325 in maximum Hebrew time next after the vernal equinox, which in AD. 325 fell March 21.430,734 in maximum Hebrew time. (14–16.)

(87). The 5th col. gives the true date of the GN. for full moon 15 days later than the Egyptian dates of new moon. And they could not be less without being less than the astronomic dates in 15 of the 19 years, and thus bringing Easter on the forbidden day of full moon, when that fell on Sunday. And full moon is 14.765 days after new moon. And this table proves that the Alexandrian cycle gave the correct dates of new moon in maximum Hebrew time in the 19 years beginning AD. 325. And this makes the true Paschal limits, about AD. 325, to be March 21 and April 19. (66–70, 102–104.)

(88). The last column contains the Dionysian dates corresponding with GN. OS., as copied from the Old Style Western Calendar (OS.) and with GN. AM., as copied from the present Greek Calendar (AM.). And this shows that Dionysius omitted GN. 8 March 6, which had been the new moon of Nisan since AD. 261, as shown by the first column in Table A (and in MDT. Mosaic, where the principle is explained), and included GN. 8 April 5 in Table A, which had been the new moon of Zif since AD. 261. And then beginning with GN. 16, March 8, which was the second in the series of the new moons of Nisan, he added 13 days to the dates, and thus made all the dates two days less than the true dates, and invariably brought Easter on the day of full moon, when that fell on Sunday. Thus, by including the new moon of Zif GN. 8 April 5, and by counting the days two days too early for the astronomic dates of the full moons of Nisán, Dionysius made the "Paschal limits" March 21 and April 18. And this calendar was adopted by the Council of Chalcedon in AD. 534. And it governed the whole Christian Church until AD. 1582, and now governs the Russo-Greek Church (AM.) in a Greek form. In both forms the consequence is shown in Table C. (66–70, 81, 89, 102–104.)

(**89**). TABLE C.

Years AD. of Coincidence.		Day of March in Maximum Hebrew Time.	GN. of AC., NS., OS.	Date of GN. AC.	Date of GN. NS.	Date of GN. OS.	GN. AM.	Date of GN. AM.	GN. of HCM., HC.	Year AD.	Day of March Cal. Hebrew Time.	Date of GN. HCM.	Date of GN. HC.
	AD.	Mar.	GN.	AC.	NS.	OS.	GN.	AM.	GN.	AD.	March.	HCM.	HC.
1288	1807	24.25	3	24	22	56	19	56	1	1883	24.01	24	52
3683	1808	42.90	4	43	41	45	1	45	2	1884	41.90	41	40
6077	1809	32.02	5	32	30	34	2	34	3	1885	31.27	31	30
1972	1810	50.66	6	21	49	53	3	53	4	1886	50.17	50 A	48 G
4367	1811	39.78	7	40	38	42	4	42	5	1887	39.54	39 A	38 A
261	1812	28.90	8	29	27	61	5	61	6	1888	27.90	27	26
2656	1813	47.55	9	48	46	50	6	50	7	1889	46.80	46 A	45 A
5051	1814	36.66	10	37	35	39	7	39	8	1890	36.17	36	34 A
946	1815	25.78	11	26	24	58	8	58	9	1891	25.53	25 A	53
3340	1816	44.43	12	45	43	47	9	47	10	1892	43.43	43	42
5735	1817	33.55	13	34	32	36	10	36	11	1893	32.80	32	31
1630	1818	22.66	14	23	21	55	11	55	12	1894	22.17	22	50 A
4025	1800	41.37	15	42	40	44	12	44	13	1895	41.06	41 A	39
6419	1801	30.49	16	31	29	33	13	33	14	1896	29.43	29	28
2314	1802	49.14	17	50	48	52	14	52	15	1897	48.33	48	47
4709	1803	38.25	18	39	37	41	15	41	16	1898	37.70	37 A	36 A
604	1804	27.37	19	28	26	60	16	60	17	1899	27.06	27 A	25
2998	1805	46.02	1	46	44	48	17	48	18	1900	45.96	46	44
5393	1806	35.14	2	35	33	37	18	37	19	1901	35.33	35	34
1288	1807	24.25	3	24	22	56	19	56	1	1902	24.69	24 A	52
		(MDT. 4th, 5th Ex.)							2	1903	43.59		

(**90**). *Explanation of Table C.* The first column is the same as the first column in Table A, and all the GN. on the same line refer to the same moon under different GN., at the beginning and end of the present century. (81.)

(**91**). The dates of full moon from 1800 to 1818 are in maximum Hebrew time in the beginning of the century, to compare with dates by AC. Table II., and by NS. Table II., and by OS., and by AM. They refer to the same GN. on the same lines from 1883 to 1902, in which the dates are in Hebrew Calendar time to compare with dates by HCM. and by HC., because those dates are astronomic. (31–51, 85.)

(**92**). The dates of GN. OS., and of GN. AM., are the same as in Tables A and B, and in the separate calendars OS. and AM., with the addition of 12 days NS. SC. (81, 85, 102–104, 126.)

(**93**). The dates of HCM. are taken from HCM. Table, thus: By HCM. Rule 1, count the Hebrew days as beginning in the evening *after* noon of the dates found

by rule. And the dates of HC. are taken from HC. Table, by HC. Rule 1 counting the Hebrew day as beginning in the evening *before* noon of the dates found by rule. Then in both cases take the date one day less and mark it A when A adds one day to the astronomic date, and subtract two days and mark the date G, when G adds two days to the astronomic dates. And these Hebrew dates are counted by Hebrew lunations, which in 1883 make the dates count 0.078,167 more than by mean lunations. And when this is added to March 45.96 in AD. 1900, all the dates of GN. HCM. agree precisely with the astronomic dates. (1–11, 75–77; HC. Notes 157–163.)

Alexandrian Canon.

(**94**). The lunar portion of the Alexandrian Canon was the Alexandrian Cycle which gave the correct dates of the 235 new moons in 19 years about the time of the Council of Nicea AD. 325. The solar portion was the Paschal Canons, to define which of these new moons was to be counted the new moon of Nisan, from which to determine the date of Easter. This was adopted as the first Christian Calendar in the century after the Council of Nicea in AD. 325, as a substitute for the annual prediction of the time of Easter, by Egyptian astronomers. (1–5, 94–107.)

(**95**). *Contra. First.* As to the origin of the Alexandrian Cycle. Jarvis (p. 87–92) gives the whole of this cycle (JE. Table) of which a part is given in Table A. He calls it "The Calendar of the Ancient Church, established by the Council of Nice." And the remarks by Dr. Hill of Athens, and the Archbishop of Corinth, indicate that they believe it to be the "Ordinance of the Council." And Rees (Canon Paschal) and the Encyclopedia Britannica say that it is attributed to Eusebius of Cæsarea, and to have been constructed by order of the Council of Nicea. (1–11, 17–26, 81, 108–119.)

(**96**). Now: Delambre (Vol. 1, p. 2) says: "The Council of Nice....supposed that the equinox remained invariably fixed on the 21st March as they found it in the year 325. There does not in fact exist any decree or any act of this Council. Their rule for the celebration of Easter is not found except in a letter, which the Fathers addressed to the Church in Alexandria. The letter itself does not exist; we do not know the dispositions, except from the testimony of certain authors who report the spirit without citing the precise expressions. According to these authors, the Paschal moon was that of which the 14th day coincides with the vernal equinox or the next thereafter. And Easter day is Sunday next after the Paschal moon." And Long (Sec. 1255) says: "This determination is not among the Canons of the Council, but may be seen in their Synodic Epistles, preserved to us by the two ecclesiastical historians, Socrates and Theodoret." Neale (p. 113) and Seabury (p. 76) say: "No such canons are found among the proceedings of the Council." And "The Patriarch of Alexandria was commissioned to announce the time of Easter." And Brady (p. 294) says that most of the Churches used the ancient Jewish cycle of 84 years. And Seabury (p. 78) quotes Prideaux to the same effect. (81, 94, 95, 108-119.)

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(**97**). Also: From internal evidence, there are several reasons for inferring, that the Alexandrian Cycle was the Egyptian substitute for the modern almanac for the sole purpose of giving the dates of the 235 moons in the cycle, and that it was adopted by the Christians to determine the dates of the full moons of Nisan,

because it gave correctly the dates of new moon about AD. 325. Thus 1st. We know that such was the use of the Egyptian Cycle, which Sosigenes, the author of the Julian Calendar, adapted to Roman dates. And one of them cut in stone can now be seen in the National Museum at Rome. (JE. Table). This has GN. 1 at Jan. 1. History and calculation make new moon fall on Jan. 1 in BC. 45, when the Julian Calendar was inaugurated. Hence BC. 45=GN. 1, and that makes AD. 325=GN. 9. And GN. 9 is dated April 1st, while in AD. 325 new moon fell March 31, and the Alexandrian Cycle gives March 31 for GN. 3. But lunar dates recede 0.002,241 day per year, and from BC. 45 to AD. 325, the date of the Roman moon GN. 9 had receded 1.20 day and fell on March 31. But the Alexandrian Cycle gave the date of GN. 3 as March 31. So that the Christians abandoned the old Roman Cycle which no longer gave correct dates, and adopted the Alexandrian Cycle which did give correct dates and made AD. 325 to be GN. 3. And from that day to the present all the cycles used by the Westerns have made AD. 325= GN. 3. And Delambre (Vol. 1, p. 37) says : "The Alexandrians gave the golden number one to March 23, because that was at that time the date of the vernal equinox, and it resulted that Jan. 1st was the golden number three." If this be so, then the Alexandrian Cycle must have been constructed about 250 years before AD. 325 when the vernal equinox fell as late in Roman time as March 23, since it receded at the rate of 0.7784 day per century. (1–5, 32, 36, 37, 81, 85. GND. and Epacts.)

(**98**). Now : If this cycle had been prepared by order of the Council, it certainly would not have had GN. 1 dated March 23, because that was the date of the vernal equinox, since the paschal canons say, that "the 21st day of March shall be accounted the vernal equinox." And we would suppose that they would have retained the similar Egyptian cycle in the Julian Calendar which makes AD. 325=GN. 9, with the correction of one day to make GN. 9 fall on March 31. Or else they would have made the year of the Council the first year of the cycle, and would have marked the date of new moon which fell on March 31 in the year of the Council with GN. 1. But they did neither. 3d. This Alexandrian cycle has no obvious connection with the date of Easter. It gives the dates of new moon from which the dates of the full moons of Nisan might be found by adding 15 days to find the full moon, on or next after March 21 of the paschal canons. And this created confusion, since some added 12, and others 13, and others 14 days. 4th. Table A shows that it pays no regard to the solar dates. GN. 8 March 6 had been the new moon of Nisan since AD. 261, and GN. 8 April 5 had been the new moon of Zif since AD. 261. But GN. 8 March 6 is put in the previous month, and GN. 8 April 5 is put at the end of the remaining new moons of Nisan. (81, 82, 99, 101–106.)

(**99**). *Contra. Second.* As to the Cycle itself. Jarvis (pp. 94, 95), after describing the Egyptian cycle in the Julian Calendar (JE. Table), continues : "The computists of the Council of Nice proceeded in a similar manner, but with a different object. The precession of the equinoxes had in the interval of time shifted the cardinal points in the zodiac, so that the winter solstice had passed from the 25th to the 21st of December, and the vernal equinox from the 25th to the 21st of March. The object of the Council was to determine the day of the paschal full moon, and to establish a rule for the computation of Easter. They found that the first new moon after the vernal equinox in the year of their session, fell on the 23d March.

They made it, therefore, the beginning of a new cycle of 19 years, and consequently marked it with the golden number one. It is possible that in the ordinary course of the Julian Calendar, the year of their session was the third of the Metonic cycle, but whether that was or was not the case, the result of placing the golden number one opposite to the 23d March was as follows :"

(**100**). Then follows the table. Then : "This mode of computation continued to be generally used in the Christian Church until the year AD. 1582, when . . . . Gregory XIII. published a bull abolishing the use of the calendar established by the Council of Nice, and substituting that which has since been called the Gregorian. In this the golden numbers were discontinued, and the system of epacts applied by Aloisi Lilio to the cycle of 19 years was adopted in its stead. Ten days were retrenched from the year on account of the precession of the equinoxes, to bring forward again the vernal equinox to the 21st March, and the 5th of October was thenceforward to be called the 15th."

(**101**). *Now: First.* The precession of the equinoxes has no effect upon calendar dates. In Julian time the date of the equinox recedes 0.7784 day per century, because the Julian year of 365.25 days is 0.007784 day longer than the equinoxial year of 365.242,216 days. *Second.* Easter depends upon the date of the first *full* moon on or after the vernal equinox, and not "the first new moon after the vernal equinox." *Third.* New Moon fell on March 31 in AD. 325. That is marked GN. 3. And from that day to the present the Western rules have made AD. 325 to be GN. 3. But the Greek rules make it GN. 19. *Fourth.* The rules of the Julian Calendar make AD. 325 to be GN. 9. And that is marked April 1st (JE. Table). Because in Julian time the moon recedes 0.3241 day per century, and from BC. 45 to AD. 325 it had receded 1.199 day. *Fifth.* The Metonic cycle (OE.) is fundamentally different from the Egyptian cycle in the Julian Calendar. *Sixth.* This calendar was not "established by the Council of Nice," according to Delambre, Long, Neale, Seabury, Prideaux, and Brady. *Seventh.* The system of golden numbers was not abolished. They do not appear in the Missal as connected with the cycle of Epacts. But in the explanatory tables, the epacts are shown to be derived from the golden numbers. And when they are collated with this cycle (JE. Table) they are seen to be substantially the dates of the golden numbers in the reverse order. And AC. Rule 5 proves it. (1, 29, 30, 32–36, 61–63, 81, 85, 89, 96, 120–130.)

Dionysian Cycle=OS.

(**102**). This never gave the dates of the full moons of Nisan, in accordance with the Paschal Canons and with the decision of the Council of Nicea. Table A shows that at its inception, it omitted the new moon of Nisan GN. 8 March 6, and substituted the new moon of Zif GN. 8 April 5. Then for the dates of full moon it added 13 days to the dates in the Alexandrian cycle, which were the dates of mean new moon about AD. 325, while full moon is 14.765 days later than new moon. And Table B shows that in most cases the dates of GN. OS. were two days before the date of full moon. And in all such cases it put Easter on the forbidden 14th Nisan, when these dates fell on Friday or Saturday, and full moon on Sunday. (1–11, 81, 85.)

(**103**). Thus: Table A shows that in AD. 261, the new moon of GN. 8 March 6 became the new moon of Nisan; and the moon one lunation later, GN. 8 April 5, became the new moon of Zif. Then AD. 273=GN. 8 next after AD. 261. In

AD. 273, in Hebrew time the vernal equinox fell March 21.336 and full moon March 21.387. This shows that the full moon of GN. 8 March 21 had just passed the vernal equinox into the month Nisan, and at the same time the new moon of GN. 8 April 5, passed into the month Zif. Then from March 21.387 subtract 14.765, leaves March 6.622 as the date of the new moon of Nisan GN. 8 in Table A, which was omitted when OS. was formed, while the moon one lunation later GN. 8 April 5 was substituted. (12, 13, 36, 81, 85.)

(**104**). Also. Table C shows that at the present time GN. OS. substitutes *five* moons of Zif for five moons of Nisan, viz., in the years GN. OS. 8, 19, 11, 3, 14. And in this order the moons of Nisan passed into the month Zif in AD. 261, 604, 946, 1288 and 1630. And GN. 6 will follow in AD. 1972. And AD. 6419 the Dionysian cycle will not have a single moon of Nisan left. This is shown by the first column of Table A. This is explained in MDT. (A) (81, 89.) And in The Churchman's Calendar for 1870 (pp. 39–43), William Moore, Esq., gives his calculations of the dates of Easter NS. and OS. from 1753 to 2013. And these show that in the years GN. 3, 8, 11, 14, 19 Easter OS. falls 4 and 5 weeks later than Easter NS. But in the other years generally one week later, and sometimes on the same day. And Table C shows that in other years, the date of GN. OS. is 4 days later than the date of GN. NS. So that if the date of GN. NS. fall not later than Wednesday, both Easters will fall on the same day.

History of the Dionysian Cycle.

(**105**). The Alexandrian Cycle gave the true dates of all new moons about AD. 325 as above shown. But the Paschal Canons required the dates of the full moons of Nisan. Then says Brady (p. 294): "The full moon of Nisan was the 14th of the moon's appearance.....The Church of Rome changed its cycles in 455, 457, 525, 1582." And Neale (p. 113) says: "AD. 455 S. Pretorius gave Easter correctly April 24, but the Western Church held it April 17." And Seabury (pp. 87, 88, 89) says: "In AD. 527 the Romans abandoned Nisan 16 as the earliest date of Easter, and following Dionysius adopted Nisan 15, as had previously been done by the Bishops of Alexandria, while the British and old Irish or Scotch had used Nisan 14." And Seabury (p. 78, quoting Prideaux) says: "No effectual cure was found till Dionysius Exiguus brought the entire Alexandrian Canon into the Roman Church, and this was adopted with entire unanimity,"—*i. e.*, the Paschal Canons and the 19 Alexandrian dates of new moons with the addition of 13 days. (1, 81, 85.)

(**106**). This cycle was adopted by the Council of Chalcedon in AD. 534. It is given by Wheatly (p. 38). It is given in the old Anglican Prayer Books (before 1752 when the English adopted NS.), "To find Easter for ever." Anathema was pronounced against any who should find Easter by any other rule. It is given in this work as a separate calendar (OS.). It is given above in Tables A, and B, and C. (81, 85, 89.) (GND.)

(**107**). The statement above, that in AD. 527 the Romans followed Dionysius and adopted Nisan 15 as the earliest date of Easter, shows that the dates of GN. OS. were regarded as the dates of the 14th Nisan. But such was not the fact, according to the Mosaic rule which determined dates at the time of the Crucifixion (1–11, 81, 85, 105.)

The Greek Calendar.

(**108**). Tables B and C show that for the same years AD. the Greek Calendar (AM.) gives the same date of Easter as the Dionysian Calendar (OS.). The only difference is in the number of the year in the cycle. And to find that year add 5508 to the year AD. for the year AM. (the "Constantinopolitan Period" analogous to JP. and used before JP.). Then divide the year AM. by the circle 19 and R=GN. AM. Consequently, all the remarks above, respecting the Dionysian Cycle apply to the present Greek Cycle. (85, 89, 102–107.)

(**109**). *Contra. First.* The following are repeated in the *Churchman's Calendar* of 1866, 1867, 1868, viz.: "The following is the explanation concerning the Greek Easter, which was given to Dr. Hill, by *Amphilochios,* formerly a pupil in the American Mission School, and now Archbishop of Corinth. The Nicean rule is followed by the Anglican and the Greek Churches alike."

(**110**). *Now.* This must signify that according to the Paschal Canons, both hold Easter on Sunday next after the date of GN., which is next after March 21. This they both do. But the Greek March 21 is 12 days later than the Anglican March 21, and falls on the Anglican April 2. (1, 74.)

(**111**). *Contra. Second.* Dr. Hill continues: "But the Anglicans reckon the moon of Nisan by the *full* moon, so that a moon which is now in Adar (February) may be considered a moon of Nisan. The Greeks, however, insist that the moon of Nisan, must be the *new* moon in Nisan, and in this they are in strict accordance with Jewish usage."

(**112**). *Now.* By the Mosaic rule the new moon of Nisan was used to find the full moon. By the present Hebrew rules (HC.) the new moon of Tisri, is used to find the full moon of Nisan. And the Alexandrian Cycle of new moons was used to find the full moons of Nisan. These show "Jewish usage." But it is not obvious, what difference it makes, whether the date of full moon is given directly in the Anglican mode or whether it is found from the date of the new moon, provided the dates agree. And some added 12, others 13, and others 14 days to the dates in the Alexandrian Cycle, until by common consent the Dionysian Cycle of full moons was adopted. And from this remark it would appear that the Athenians use the Alexandrian Cycle of new moons, and like Dionysius, add 13 days for the date of full moon, while others in the same Church, use the cycle of full moons as given in AM., since that was obtained from a Sclavonian Priest, and what is there copied as to the date of Easter, is from "The full Christian Calendar, by the Metropolitan of Kiev." (6–8, 81, 105.)

(**113**). *Contra. Third.* Dr. Hill continues: "Another rule operates, viz.: that when the Jewish Passover falls on Sunday, then the Easterns celebrate Easter on the Sunday following, and so it happened in 1864 that by these differences, and those of Old Style and New Style, the Greek Easter was five weeks later than ours, and fell on our 1st May, which with them was April 19."

(**114**). *Now.* This Greek date of Easter April 19 OS. in 1864 is among the dates copied from the calendar by the Archbishop of Kiev. (AM.) In AC. 4th Example it is shown that this was 10 days after the date of full moon April 21.848. And that this was the Mosaic full moon of Zif, one month after the full moon of Nisan. And the same thing occurs in each 5 out of 19 years. AD. 1864=GN. AM. 19 in Table C shows that the Greek Easter falls in the month Zif, in each GN. AM 19, 5, 8, 11, 16, for the reasons explained above. (36–40, 81, 82, 102–104, 116.)

(**115**). *Contra. Fourth.* Dr. Hill continues : "The Greek rule is undoubtedly the Nicean one, and should be our ecclesiastical law ; but the Western astronomical law (NS.) is scientifically correct. We suggest, the Greeks should adopt New Style, and the Anglicans their rule of Nisan, and there will be a fair and orthodox adjustment of the difference. There should be, also, a prime meridian."

(**116**). *Now.* It is not apparent how this could be done, since the whole object of the Gregorian Calendar was to correct the errors of the Dionysian Calendar. And the Greek Calendar is precisely the same as the Dionysian in a Greek form. This is shown by Tables B and C. (89, 90.) And the Council of Nicea decided that Jerusalem should be the prime meridian, when it decided that Easter should not be held on the 14th Nisan, since this is a Hebrew date, and that counts Jerusalem as the prime meridian. And it is the prime meridian of all Hebrew and Christian calendars. (1–11, 85, 89.)

(**117**). *Contra. Fifth.* Dr. Hill continues : "The Nicean Council, says the Abbe Guettee, ordered that the Christian Easter should be kept always after the Jewish Passover, as the substance after the type. By the Latin and Anglican rules, this law is sometimes violated."

(**118**) *Now.* By the Nicean rule, Easter always falls on the Mosaic date of the Passover, when that falls on Sunday, since the day to be avoided is the day before the Passover, as the anniversary of the Crucifixion. AC. 1st and 2d Examples show that in 1825 and 1903 Easter and the Passover fall on the same day. But in both cases it is the day of full moon. By the Mosaic rule the 14th day of Nisan was the day of full moon. And the full moon could not possibly fall later than the end of the 14th. So that NS. Easter fell on the forbidden 14th Nisan, and the Hebrews held the Passover on the Mosaic 14th Nisan. AC. Indexes put Easter one week later, and HCM. Rule 1 puts the Passover one day later. (1–11, 72, 73.)

(**119**). *Contra. Sixth.* Dr. Hill continues : "The Greeks may admit the Gregorian Calendar, but never the Latin rule of Easter. The ordinance of the Council must be held superior to mere scientific adjustment."

Now. This appears to signify that the Greeks may admit the Gregorian Calendar as to civil dates, but never change their present rule to find Easter, since they regard that as the ordinance of the Council of Nicea. But it is above shown that the Dionysian Cycle never gave correct dates. It began AD. 534 with omitting one of the moons of Nisan, and including one moon of Zif. Now it has five moons of Zif to the exclusion of five moons of Nisan. It began with dates two days before full moon, and this frequently brought Easter on the forbidden 14th Nisan. And these original errors arose from misunderstanding the Alexandrian Canon, which is a "scientific adjustment" to give lunar dates. And even this was not by ordinance of the Council as Jarvis says (pp. 87–92), for Delambre, Long, Neale, Seabury, Brady, say that no such Canons are found among the proceedings of the Council. And from internal evidence it appears to have been the Egyptian substitute for a modern almanac. This we know was the use of a similar Egyptian cycle in the Julian Calendar. (JE. Table.) (94–98, 102–104.)

Table A. Epacts (81).

(**120**). In the Roman mode of determining ecclesiastical dates by NS. Table VII., the Dominical and the Epact are given. The Missal gives a table for 365 days in the year, with the Roman and the modern day of the month, and the Sun-

day letter and the epact for each day of the month. The GN. are not given, but when this Table of Epacts is collated with the Alexandrian Cycle, and with the cycle in the Julian Calendar (in JE. Table) it is seen that each GN. 3 of the former and GN. 1 of the latter is marked with an asterisk as the fundamental epact at Jan. 1, 31, 60, 90, 119, 149, 178, 208, 237, 267, 296, 336, 355. This shows a regular alternation of 30 and 29 days. And these asterisks are shown at March 1 and 31 in the Table A as copied from the Missal. And the NS. Retractions are produced by the double Epacts at April 4 and 5 in the table for new moons, as by retracting the dates of GN. from April 19 and 18 in the Anglican mode, in NS. Table III. (66–70, 84.)

(**121**). In AC. Table I. the Epacts are 13 days later than in the Roman Missal, and the double Epacts 25 and 24 are omitted in omitting the NS. Retractions by Contra. Rule 8. These Epacts and the Sunday letters are permanently attached to the same dates. In the Anglican mode the dates of the GN. are given in AC. Table IV. as they here stand with the corresponding Sunday letters. Then the Dominical will show which is the next Sunday after the date of that GN. In the Roman mode, the Epact is given. This is substantially the date of the GN., and AC. Rule 5 is substantially the same as AC. Rule 4. And for each day advance of the date of the GN., the Epact will recede one day, as shown in AC. Table I. (29, 30, 61–63, 66–70, 100, 101.)

(**122**). *Contra. First.* The Rev. Samuel Seabury, D.D., on "The Theory and Use of the Church Calendar" (p. xii.), explains for the use of "laymen" (p. xi.) "a traditionary system which disclaims demonstration." And (p. 7), "Neither is it necessary for one to be either an astronomer or a mathematician." And (p. 117), "Science must come down from her throne and condescend to accept the cycles which the custodians of the Church have treasured up." And (p. 118), "It must be kept wholly out of the domain of demonstrative science." And (p. x.), "I know of no treatise specially devoted to it." And (p. xi.), "A rule which may indeed be verified by experiment, but the reason for which no author that I have seen has been at the pains to unfold."

(**123**). *Now.* The Council of Nicea in AD. 325 decided that Easter should not fall on the 14th day of Nisan, the anniversary of the Crucifixion, but on the Sunday next thereafter. Different artificial calendars have been constructed to give this astronomic date. It is purely a question for science to determine whether their authors have succeeded in doing what they attempted to do. Its importance is a matter of opinion. Science deals only with facts. (1–11, 40, 48–51, 54, 93, 102–108, 124.)

(**124**). *Contra. Second.* Dr. Seabury (p. xiv.) desires to "recast" the Anglican Calendar and use epacts instead of golden numbers. He calls golden numbers "the peculiarities of the Hanoverian method, which has been fastened upon us in our English and American Prayer Books" (pp. 123, 194 ; xiv. ; 89 ; 189 ; 200 ; 211). Then (pp. 193, 194), "As if the Church, wearied of God's own ordinance for the regulation of her ancient solemnities, should choose some strange light, which should shine like the Dog Star but for one month in the year. . . . In no other age . . . . could the heirloom of a thousand years be torn from her without a protest." Then (pp. 197, 198, 211), "Why direct us to Easter by Golden Numbers, with complicated tables for changing them century after century, instead of directing us to find Easter by means of the simple and immutable system of epacts." And (p.

206), "That wilderness of figures which constitute the Second and Third of our General Tables."

(**125**). *Now. First.* The Dog Star is visible to the naked eye for about eleven months, and becomes *invisible* in the light of the sun for about one month. *Second.* What he means by "God's own ordinance" is not obvious. He may mean the epacts, since the Missal gives them for every day in the year. But those are modern, and were not used "for the regulation of her ancient solemnities." He may mean the first Christian Calendar (NC.), since that gave the date of every new moon. And that was used "for the regulation of her ancient solemnities." But that appears to have been the Egyptian substitute for a modern almanac. And that was not used to determine the date of Easter until the century after the Council of Nicea in AD. 325. (94–101, 119–121.)

(**126**). *Third.* "The heirloom of a thousand years" (AD. 534 to 1582) was the Dionysian Cycle (OS.). This, like the present Anglican tables, gave only the full moons of Nisan in one month, and therefore shone "but for one month in the year." And when the Church of Rome introduced epacts for the whole year, the Anglicans retained the form of this "heirloom." And the Greeks still retain it intact. (83–85, 88, 92.)

(**127**). *Fourth.* "The Hanoverian method" of giving lunar dates by Golden Numbers in a cycle of 19 years was used by Meton, BC. 432 (OE.) and in the Julian Calendar of BC. 45 (JE.), and in the first Christian Calendar of about AD. 425 (JE. Table), and in the Dionysian Cycle of AD. 534 (OS.). And this remained "the heirloom of a thousand years" until in AD. 1582 the Church of Rome substituted epacts. And the Greek Church still uses the Dionysian cycle with Greek Golden Numbers (AM.). And the Hebrews use GN. (HC.). (81–93.)

(**128**). *Fifth.* The Golden Numbers are not found in the Missal in connection with the epacts, except in explanatory tables. But when the two Egyptian cycles are collated with the epacts (JE. Table) the epacts are found to make the standard —every GN. 3 of one, and every GN. 1 of the other. And these "permanent and immutable" epacts are like Sunday letters, and the epacts found by rule are like the Dominical, to determine which of the permanent epacts is to be used. And epacts are substantially dates of the GN. in the reverse order. And the Church of Rome changes its epacts "century after century," to produce the same effect as "that wilderness of figures which constitute the Second and Third of our General Tables." And the Anglicans had 170 years to simplify the rules from AD. 1582, when NS. began, to 1752, when it was adopted (entire) by England. And that "wilderness of figures" (NS., Table III.) is a splendid specimen of condensation, and so simple that the whole 570 dates can with ease be memorized And the entire NS. system is contained in NS. Tables II. and III. On the contrary, the Roman Missal takes two tables and 52 lines of printing to explain only one change of epacts, and then refers to a nameless "book" for further information as to the remaining 28 changes during the time covered by NS. Table II. (29, 30, 61–63, 120, 121.)

(**129**). *Contra. Third.* Dr. Seabury (pp. 78, 67, 71, 72, 90), "The Alexandrian Canon was founded on the lunar cycle of Meton (reduced from 6940 to 6939 days 18 hours." And (p. 19), "The Hebrews . . . . in common with most ancient nations . . . . began the civil year which was a solar year of 365 days, at the autumnal equinox." And (p. 14), "365 days are still assumed to be the length of the

year in the Calendar of the Church and of all civilized nations." And (p. 225), "Ten days which were cancelled in 1582 on account of the precession of the equinoxes."

(**130**). *Now. First.* The Egyptian (NC.) and the Metonic (OE.) and the Hebrew (HC.) cycles all contain 19 years, because 235 lunations are nearly the same as 19 years. But neither is founded on the other. They are all fundamentally different. *Second.* The ancient Hebrews counted from the vernal equinox (HCM.). Their years consisted of 12 or 13 lunations, and had about as many lengths as the present Hebrew Calendar (HC.) which makes the years 353, 354, 355, 383, 384, 385, but never 365. And the Metonic cycle (OE.) counted from the summer solstice, and like the Hebrews, their years were lunar. The Romans began the year on Jan. 1, and had 1461 days in 4 years, or 365.25 on the average. And no known calendar had consecutive years of 365 days except the ancient Egyptian (NE.), and that had no regard for equinoxes or solstices. *Third.* The precession of the equinoxes has no effect upon calendar dates. It would be unknown if there were no fixed stars. (101.)

(**131**). Before the introduction of the Gregorian Calendar, Peter ab Alliaco and Cusa had proposed a reformation of the calendar to the Councils of Constance and of Lateran. In 1474 Sextus IV. engaged Regiomontanus (Muler), who died, and the work was stopped. Gregory XIII. acted under the advice of Clavius and Ciaconius, Aloysius, Lilius, and others. This Council of astronomers used the Alphonsine Tables of the sun, and Tycho Brahe's of the moon, and were ten years in framing the calendar. And Delambre (Vol. 1, p. 12) says: "I found it better than its authors supposed it to be." (Long, Sec. 1244–1273; Jarvis, pp. 95, 96, 105–110; Brady, pp. 28, 29; Adams, pp. 354, 355; Wheatly, pp. 34–47; Renwick—Calendar; Rees—Calendar, Cycle, Number; Missal—De festibus mobilibus; Mouravieff, Vol. 1, pp. 355-6; Delambre, Vol. 1, p. 12). Long (1267) says that Clavius explains the system and defends it from the attacks of Mæstrinus, Vieta, and Scaliger.

(**132**). AUTHORS.

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AE.

AE=Actian Era=Augustan Era=new Egyptian Era, began NE. 720, Thoth 1st=JP. 4685 Aug. 30 regular, but called Aug. 29 by the Romans.

AE. Rule 1. For the year JP., add 4684 to the beginning of the year AE. And for the beginning of the year AE., subtract 4684 from the year JP.

AE. Rule 2. For the year JC., subtract one from the year JP. or AE., and divide R by 4, and 2d R=year JC.

AE. Rule 3. For the day of Thoth. Add the given day of the given month to the number prefixed to that month in the following table: 0+Thoth; 30+Paopi; 60+Athir; 90+Choiak; 120+Tybi; 150+Meheir; 180+Phamenoth; 210+Pharmouthi; 240+Pachon; 270+Payni; 300+Epiphi; 330+Mesori; 360+Epagomenai.

AE. Rule 4. For the day of the month. Subtract from the day of Thoth the number which is next less in Rule 3, and R=the day of the month to which that number is prefixed.

AE. Rule 5. For AE. OS. into JP. (changing only the number of the year NE.): Multiply the year AE. by 365, and to P add the day of Thoth (by rule 3) and the constant 1,710,707, and S=DJP.

AE. Rule 6. For JP. into AE. OS. Reduce the date to DJP. (A). From DJP. subtract 1,710,707. Divide R by 365 for Q=year AE., and 2d R=day of Thoth, which reduce by rule 4.

AE. Rule 7. AE. NS. into JP. (changing the number of the year NE. and adding a sixth Epagomenas in the same year as the Roman Bissextile). Subtract one from the year AE. Divide R by 4 for 1st Q and 2d R. Multiply 1st Q by 1461 and 2d R by 365. To the two products add the day of Thoth (rule 3) and the constant 1,711,071, and S=DJP. (A).

AE. Rule 8. JP. into AE. NS. From DJP. subtract 1,711,071. Divide 1st R by 1461 for 1st Q and 2d R. Divide 2d R by 365 for 2d Q and 3d R=day of Thoth. Multiply 1st Q by 4, and to P add the 2d Q and the constant *one*, and S =year AE. Then reduce the day of Thoth by rule 4.

AE. Rule 9. For JE. Correction. If the year AE. or JP. be found in this table, then for the actual Roman date, subtract from the regular date found by AE. Rules 5 or 7 the number of days in the third column from Feb. 25 +days opposite to the year, until Feb. 25+days opposite to the next year in the table. And to find the regular date for rules AC. Rules 6 and 8 from the actual Roman dates, add the days in this table from Feb. 25 of the year opposite, to Feb. 25 of the next year in the table.

AE.	JP.	Day.
1	4685	1
3	4687	2
5	4689	1
6	4690	2
12	4696	3
13	4697	2
15	4699	3
17	4701	2
18	4702	3
21	4705	2
25	4709	1
29	4713	0
33	4717	0

AE. 1st Ex. For AE. OS.—On the authority of Censorinus, AE. began JP. 4685=NE. 720. By the Rules of NE., Thoth 1st fell on Aug. 30 in NE. 720. Then by AE. Rule 5; AE. 1×365+Thoth 1+constant 1,710,707=DJP. 1,710,073. Then DJP. 1,710,073−365; ÷1461=Q 1170+R 1338; ÷365=2d Q 3+2d R= Jan. 243, which in JC. 0=Aug. 30. Then Q 1170×4+2d Q 3+2=JP. 4685.

Thus for all time AE. OS. will give the same day of the month as the ancient NE., but differ only in the year. And all the rules give the regular dates, without regard to the JE. Correction by Rule 9. For the year JP. 4685, subtract one day from Aug. 30, leaves Aug. 29 the actual Roman date of 1st Thoth.

AE. 2d Ex. For AE. NS. AE. 5, Thoth 1. Then AE. 5−1;÷4=Q 1+R 0; Q 1×1461+R 0×365+Thoth 1+constant 1,711,071=DJP. 1,712,533=JP. 4689 Jan. 242 in JC. 0=Aug. 29. By Rule 9 subtract one day=Aug. 28 the actual Ro man date, and required an extra intercalary to make Thoth 1st, the same as the Roman Aug. 29, at its erroneous date.

AE. 3d Ex. For AE. NS. AE. 33. Thoth 1=DJP. 1,722,760=JP. 4717, Jan. 242 in JC. 0=Aug. 29, regular date and the Roman date, requiring the intercalary in the same regular year as the Roman year, to keep Thoth 1st always the same day as the regular Roman Aug. 29.

AE. 4th Ex. For AE. OS. Censorinus says that in AE. 267, Thoth 1st fell on June 25. Then 267×365+1+1,710,707=DJP. 1,808,163=JP. 4951 June 25. This shows that AE. NS. was not in general use.

AE. 5th Ex. For AE. NS. Josephus published his Antiquities in AE. 122, and synchronizes Pharmouthi with the Macedonian Xanthicus, or April. Now, by AE. Rule 3, Pharmouthi 1st=Thoth 211. Then AE. 122, Thoth 211=DJP. 1,755,477=JP. 4807, Jan. 86 in JC. 2=March 27=1st Pharmouthi. So that April began on 6th Pharmouthi. This proves that Josephus used AE. NS., for by AE. OS., the 1st Pharmouthi fell AE. 122, Feb. 26. (HC. Notes 91, 111, 113.)

AE. NOTES.

1. AE=Augustan Era=Actian Era=new Egyptian Era; founded on the victory of Augustus over Antony and Cleopatra, at the naval battle near the promontory of Actium.

2. Rule 1 makes AE. 1=JP. 4685, on the authority of Censorinus, "that most excellent and most learned vindicator of dates and of antiquity" (Scaliger, p. 201). And (p. 236) Scaliger says that "Censorinus states, that the Augustan Actian year 267 was....986 of Nabonassar." And Jarvis (p. 118) says of Censorinus, that "in the year in which he wrote (the 283d of Cæsar's Reformed Calendar and as he computes the 267th of the Egyptian Augustan years) the first of Thoth fell on June 25th." (AE., 4th Ex.)

3. Now: AE. 267 from NE. 986 leaves 719 years *difference*, so that AE. 1+719 =NE. 720. But Scaliger (p. 236) says this makes AE. 1=NE. 719. Then JE. 283+4668=JP. 4951, subtract 267 leaves 4684 *difference*, so that AE. 1+4684= JP. 4685.

4. *Contra.* Scaliger as above, makes AE. 1=NE. 719. And (Prol. xxii.) he says, that JE. 43=AE. 28, or a difference of 15, so that AE. 1+15=JE. 16= JP. 4684. And the Oxford Chronological Tables give AE. 1=JP. 4687. (9.)

5. *Rules* 5, 6. For the constant 1,710,707. AE. 1=NE. 720. Then NE. 720, Thoth 1=DJP. 1,711,073=AE. 1, Thoth 1. Then to leave room for AE. 1×365; +Thoth 1, subtract 366 from 1,711,073 leaves the constant 1,710,707.

6. *Rules* 7, 8. For the constant 1,711,071. Assume that the change from AE. OS. to AE. NS. was made in AE. 1=JP. 4685=JC. 0, by inserting in that year the sixth epagomenas, so as to add one day in the same year as the Roman bissextile and make Thoth 1st the same as Aug. 29 or Jan. 242 in JC. 0. Then to put this extra day in AE. 1, 5, 9, etc., subtract one from the year AE., so that R 0, 4, 8, etc.,÷4 leaves 2d R=0, and Q×1461 puts the extra day in AE. 1, 5, 9, etc. Then to make Thoth 1st fall JP. 4685 Jan. 242, this date=DJP. 1,711,072. Subtract one day to leave room for Thoth 1st and the constant=1,711,071.

7. This does not imply that the change was made in AE. 1. It gives for all time the date of Thoth 1st=Aug. 29, regular. In AE. 1=NE. 720, Thoth 1 fell on Aug. 30 regular, and in AE. 5, Thoth 1 fell on Aug. 29 regular. But the Romans counted both these dates one day less, so that in AE. 1, the regular Aug. 30 was the Roman Aug. 29, and without any change in AE. 1, this Roman date Aug. 29 was made permanent. Then in AE. 5, the Romans counted the regular Aug. 29 as 28, and this required an extra day to make it the Roman Aug. 29. But AE. 5 was the regular bissextile, while the Roman bissextile was AE. 3, so that AE. 3 or JP. 4687 must have been the first year in which AE. NS. used the sixth Epagomenas. (4, 9.)

8. Rule 9 gives the difference between the regular dates of calculation and the actual Roman dates. Rules 7, 8 for AE. NS., follow all the irregularities of the Roman dates, by making Thoth 1st always fall on Aug. 29. These are the regular dates. But they have the same name as the Roman dates, and thus give Roman dates when corrected by Rule 9. But when dates are recorded, for comparison with other dates, by JP., this difference must be recognized.

9. The adjoining table will illustrate Rule 9. The Julian Calendar (JE.) began with a bissextile JE. 1. The system required a bissextile every four years, as shown in column 3. And all calculations assume that the bissextiles were observed as in column 3, and these make Aug. 29 fall at a uniform date as shown in column 5. Cæsar was assassinated. Sosigenes, the author of the calendar, disappeared. The priests who had charge of the calendar, had a bissextile every "fourth" year as the Romans count, so that they fell as in the 4th column. And in JE. 34 the actual date Aug. 26 was the same day as the regular Aug. 29, as shown in columns 5, 6. To correct this error Augustus omitted the intercalaries in the three regular years JE. 37, 41, 45, so that in JE. 45 (BC. 1) after the last omission of "Bis-sextum Kalendas Martii," the dates became regular, and in JE. 49 (the next regular year for the bissextile) the intercalation was resumed and carried on regularly.

JE. Corrections.

1	2	3	4	5	6	7	8	9
Year JP.	Year JE.	Bi-sextiles Regular.	Bissextiles Actual.	Aug. 29 Regular	Reg. 29 called by the Romans.	Year AE.	AE. OS. Thoth 1st.	AE. NS. Thoth 1st.
4669	1	1	1	29	29			
4670	2				29			
1	3				29			
2	4		2		28			
3	5	2		29	29			
4	6				29			
5	7		3		28			
6	8				28			
7	9	3		29	29			
8	10		4		28			
9	11				28			
4680	12				28			
1	13	4	5	29	28			
2	14				28			
3	15				28			
4	16		6		27			
5	17	5		29	28	1	30	29
6	18				28			
7	19		7		27			
8	20				27			
9	21	6		29	28	5	29	29
4690	22		8		27			
1	23				27			
2	24				27			
3	25	7	9	29	27	9	28	29
4	26				27			
5	27				27			
6	28		10		26			
7	29	8		29	27	13	27	29
8	30				27			
9	31		11		26			
4700	32				26			
1	33	9		29	27	17	26	29
2	34		12		26			
3	35				26			
4	36				26			
5	37	10		29	27	21	25	29
6	38				27			
7	39				27			
8	40				27			
9	41	11		29	28	25	24	29
4710	42				28			
1	43				28			
2	44				28			
3	45	12		29	29	29	23	29
4	46				29			
5	47				29			
6	48				29			
4717	49	13	13	29	29	33	22	29

10. *Contra.* Scaliger (p. 231) gives a table which shows the regular bissextiles the same as in column 3, but extended to JE. 53. Then the irregular bissextiles the same as in column 4, except that he omits the intercalation in JE. 1, and extends it to JE. 37, and makes the intercalations coincide in JE. 53 instead of JE 49. That is, Scaliger agrees with columns 3, 4, which agree with Jarvis (p. 113) except that Scaliger supposes that Sosigenes did not carry out his own system by beginning with a bissextile.

11. *Again.* Scaliger (p. 236) says : "At length in the Julian year 49, which was the twelfth running, of those which Augustus passed without intercalation, they counted the quarter of a day at the end of Aug. 28, and in the 52d year at the end of the same 28th day was intercalated one day composed of four quarters, which was the first correct (or regular *recta*) intercalation in the Actian Era." Now : That the year 49 was passed without intercalation, agrees with his contradictory statement above. But the year 52 was not a bissextile in either case. And the connection is not obvious, between the present question, and "a quarter of a day at the end of Aug. 28" in JE. 49, and "one day composed of four quarters ....intercalated at the end of the same 28th day" in the 52d year. Nor is it obvious what he means, by the statement that the intercalation of the day composed of four quarters at the end of Aug. 28 in JE. 52, "was the first correct (or regular) intercalation in the Actian Era." For if this signifies that in JE. 52 the Egyptians first made Thoth 1st, to coincide with the Roman Aug. 29, then the Egyptians must have interpolated *seven* days, since in JE. 52, Thoth 1st of the old year, had receded to Aug. 22, as shown in the table. If it signifies that the Egyptians had followed the irregular intercalation of the Romans (as supposed in AC. Rules 7, 8), and that the first regular intercalation was in JE. 52, then they made a "regular" intercalation, at an irregular date, since JE. 52 was not a regular bissextile, according to Scaliger himself.

12. *Contra 2d.* Jarvis (p. 117) says: "In AJP. 4689, the Roman system of inserting one day in every four years appears to have been adopted." Here he contradicts his own statement as shown in the table, for at that time the Romans inserted one day in every *three* years. He continues : "Because in that year the first day of Thoth coincided with that day," *i. e.*, Aug. 29. Now, the table shows, that in JP. 4685, Thoth 1st fell on the regular Aug. 30, which by the Romans was counted Aug. 29. So that there was no necessity of inserting one day to make them agree. For the same reason there would have been no necessity of inserting one day in JP. 4689 to make them agree if "in that year the first day of Thoth coincided with that day." And the table shows that in JP. 4689, the first day of Thoth did fall on Aug. 29. But this was the regular Aug. 29 of calculation which the Romans called Aug. 28. So that an extra day was required in JP. 4689. But this was the year for the regular bissextile of calculation, while the actual Roman bissextile was JP. 4687 (as all agree), so that the first insertion of the extra day must have been in JP. 4687, two years after the beginning of AE. in JP. 4685 according to Censorinus. And this may be what is intended by the Oxford Chronological Tables in making the Actian Era begin JP. 4687. (AC. Note 132 ; JE. Notes 7–17.)

AM.

Russo-Greek Calendar.

AM = Anno Mundi = Year of the World.*

1. For the year AM. add 5508 to the year AD., or subtract the year BC. from 5509. For the year AD. subtract 5508 from the year AM. For the year BC., subtract the year AM. from 5509.

2. CYCLES. Divide the year AM. by the Circle 19 for AM. GN. (Golden number or lunar cycle); or by the Circle 28 for AM. Solar Cycle; or by the Circle 15 for Indiction; and the remainder will be the year of the cycle.

3. HAGION-PASCHA = Greek Easter. Find AM. GN. and Solar Cycle (AM. 2). Then opposite to AM. GN., in the adjoining table, find the date of Nomikon Pascha, or ecclesiastical full moon. Then in (AM. 6) find the year of the Solar cycle at the head of one of the columns, and under that number, find the Ferial 1 to 7 = Sunday to Saturday for the 1, 8, 15, 22, 29 of each of the months in that year, beginning with March 1. Subtract this Ferial from 2 or 9, and the remainder is the day of the month on which falls Sunday. Then add periods of 7 days to find Sunday next after the Nomikon Pascha, and that is the date of Hagion Pascha = Greek Easter = OS. Easter. (NB. Calendars 11, 12; NB. GND. 13; OS. 2; 3—2; NB. scale 7.)

4.

Date.		GN.
March	21	13
"	22	2
"	24	10
"	25	18
"	27	7
"	29	15
"	30	4
April	1	12
"	2	1
"	4	9
"	5	17
"	7	6
"	9	14
"	10	3
"	12	11
"	13	19
"	15	8
"	17	16
"	18	5

5. MOVEABLE FEASTS; find from the date of Hagion-Pascha or Easter by (NS. 6).

6. SOLAR CYCLE.

	1 7 12 18	2 13 19 24	3 8 14 25	9 15 20 26	4 10 21 27	5 11 16 22	6 17 23 28
March	6	7	1	2	3	4	5
April	2	3	4	5	6	7	1
May	4	5	6	7	1	2	3
June	7	1	2	3	4	5	6
July	2	3	4	5	6	7	1
August	5	6	7	1	2	3	4
September	1	2	3	4	5	6	7
October	3	4	5	6	7	1	2
November	6	7	1	2	3	4	5
December	1	2	3	4	5	6	7
January	4	5	6	7	1	2	3
February	7	1	2	3	4	5	6

7. *Examples* extracted from the "Full Christian Calendar by the Metropolitan of Kiev, printed at Kiev, 1842."

Year AD.	Year AM.	Indic.	GN.	Solar.	H. Pascha.
1853	7364	14	11	28	April 15
1857	7365	15	12	1	" 7
1858	7366	1	13	2	March 23
1864	7372	7	19	8	April 19
1865	7373	8	1	9	" 4
1866	7374	9	2	10	March 27
1867	7375	10	3	11	April 16

* See NS. Preface.

AM. NOTES.

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(1). AM.=Anno Mundi=Greek Year of the World=Russo-Greek Calendar. The manner in which this calendar can be made to represent the Nicean rule without changing its cycles, is shown in AC. Tables II., III. Its errors and contradictions are shown in AC. Example 4, and in AC. Notes 30–119.

(2). AM. is the Oriental form, as OS. is the Western form of the Dionysian Cycle, which added 13 days to the correct dates of 19 new moons in the Egyptian Cycle of 235 new moons, about the time of the Council of Nicea. This in AD. 534 was adopted by the Council of Chalcedon to give the dates of the 19 full moons of Nisan, to find the dates of Easter on the Sundays next thereafter in accordance with the Nicean rule. OS. retained the Egyptian numbering of the years in the cycle, which produces the remarkable connection between the GN. and their dates (Scale). But AM. changed this numbering, for the supposed purpose of making it agree with the numbering of the years in the cycle which was then in use by the Greeks. And if 3 years in a circle of 19 be added to GN. AM., the table of *Nomikon Pascha* in AM. will be identical with the table of the Full Moons of Nisan in OS.; for the same absolute years. And the Solar Cycle of AM. Rule 6 necessarily gives the same dates for the same days of the week, as does the Solar Cycle in OS. And throughout the two calendars are substantially identical, so that the rules of OS. will produce precisely the same results as tho rules of AM. And both calendars are given in a condensed form, with references to the rules described in NS., which are the same for NS., AM., and OS.

(3). The year AM. is called the year of the Constantinopolitan Period. It was used by the Russo-Greeks as a civil date until AD. 1725, when they adopted the Dionysian Period (AD. and BC.). They still retain Julian dates (OS.), which the Westerns abandoned when they adopted NS. And in correspondence, both dates are given, as NS. began Oct. 5–15 AD. 1582. And the years of their cycles begin with March 1st, as shown in AM. Rules 3 and 6, and in their modern cycle of new moons. (AM. GND. in GND.) (Brady, pp. 51–2; Mouravieff, pp. 355–6.)

(4). The year AM. is an artificial period, analogous to Scaliger's Julian Period (JP.) for the Western cycles, as shown in AM. Rule 2, and Examples, which have been extracted to show the connection between the years AM. and the first and last years of the three cycles. But this use of AM. is so little known among the Greeks, that the Greek author of the "Book of the Litany," takes three pages to give the rules to find the years of the three cycles, which are given in three lines in AM. Rule 2. And that rule is an original deduction from these three pages, and from the examples. (10, 15.)

(5). The example of AD. 1864 shows one of the five years in each cycle of 19 years, in which the Greek Easter falls a lunar month too late for the Nicean rule. (AC. Notes 85–91 ; 108–119.)

(6). The year of Indiction is the same year AD. by AM. Rule 2, and OS. Rule 2, and NS. Rule 9. It was a general ecclesiastical date, when civil dates differed. In our almanacs it is each year given as the year of the "Roman Indiction." But it is Greek, as well as Roman. It began AD. 313.

(7). The Solar Cycle in the original had letters instead of figures for the days of the week, which are numbered from the First to the Fifth, then Friday is called Paraskeuê=Preparation, and Saturday is Sabbaton. (HC. Note 78.)

(8). The Examples in 6 columns are extracts from a table with 21 columns, including the columns of Lunar Bases (or Epacts) and Nomikon Pascha (or GN.) as given below. Then add the column of dates of New Moon for the corresponding GN. from a manuscript table of the 235 new moons in the cycle of 19 years, of which an extract is given in columns 2 and 7 of GND., with this rule in the original: "If you seek in the month of January or February, then it is necessary that you take the cycle of the moon [GN.] of the previous year." (3.)

(9).

AD.	AM.	Ind.	S. Cy.	L. Cy.	L. B.	H. Pas.	N. Pas.	N. Moon.
1856	7364	xiv	xxviii	xi	4	April 15	April 12	Mar. 25
1857	7365	xv	I	xii	15	April 7	April 1	April 13
1858	7366	I	II	xiii	26	Mar. 23	Mar. 21	April 2
1864	7372	vii	viii	xix	3	April 19	April 13	Mar. 27
1865	7373	viii	ix	I	14	April 4	April 2	April 14
1866	7374	ix	x	II	25	Mar. 27	Mar. 22	April 3
1867	7375	x	xi	III	6	April 16	April 10	Mar. 23

(10). These examples show, Rule 1. For the year AM. add 5508 to the year AD. And Rule 2. For the three chronological cycles divide the year AM. by the circles 15, 28, and 19, and R=Indiction, Solar Cycle, Lunar Cycle (GN.). And the first and last years of each cycle are given. (3, 4.)

(11). The Lunar Base of the Greeks is called the Epact by the Westerns, as proved by this column, thus: For NS. Epact, multiply GN. by 11, and to P add the key Epact and divide S by 30, and R=NS. Epact. Then modify this rule to meet 3 days' difference in dates, and the difference in numbering the years in the cycle which makes the last three years of the Greek cycle overlap the first three years of the Western cycle, and the rule becomes this: Multiply GN. by 11, and divide P by 30, and add 3 for AM. epact, except for the years GN. 17, 18, 19 add 4 days, and if the sum exceed 30, then subtract 30, because the epact cannot be more than 30. (NS. 12; AC. Table 3, AC. Notes 29, 30, 61–63, 81–132.)

(12). The Greek lunar base necessarily remains the same for all time, since the epact is substantially the date of GN. in the reverse order, and the Greek dates of GN. remain the same for all time. And it is not required to determine ecclesiastical dates. But NS. epacts are used by the Church of Rome to determine ecclesiastical dates, and they are changed century after century, to produce precisely the

same results, as by the Anglican mode of changing the dates of the GN. thirty times in a great lunar cycle in accordance with NS. Table II. (NS. 2, 7; NS. Notes 31–35.)

(13). In this extract, the dates of the Nomikon Pascha agree with Rule 4, which is copied from a manuscript table, except in accordance with this table by the Metropolitan, GN. 12 is dated April 1, while in the manuscript GN. 12 is dated March 31. This is certainly a mistake in copying. The addition of 3 years in a circle of 19, to the GN. in Rule 4, makes that table identical with the OS. Table, and the OS. Table is the original Dionysian cycle. (AC. Notes 81–132.)

(14). The difficulty in finding the rules of this Russo-Greek Calendar (which at the present time governs the ecclesiastical dates of such a large section of the Christian Church) is very remarkable. The Western forms of the Christian Calendars, ancient and modern (OS. and NS.), are given in the ancient and modern Anglican Prayer Books and Roman Missals. And many authorities were found on these subjects. (AC. Note 132.)

(15). But, while finding the Greek Calendar—of the saints, and several references to dates, I could not find the calendar of dates in any book, in Greek, Latin, French, German, or English, of which the title promised success, in private libraries and in the Astor Library. Then by advice of the Librarian, I called on Dr. Young (subsequently Bishop of Florida), as having the best Oriental library in the country. We could not find this calendar in the voluminous Greek service books, nor in the large book of Rubrics. Nor did he inform me where I could find it.

(16). It was finally obtained in the "Full Christian Calendar, by the Metropolitan of Kiev," in Sclavonic text with Arabic numerals, and in three leaves of the "Book of the Litany" in printed Greek, with a manuscript mediæval Greek translation of the Sclavonic, from "Father Agapius," who was a priest in the Russo-Greek Church, and a Sclavonian, and at that time the proof-reader of Sclavonic for the Bible Society. (4.)

(17). Hence, no printed authority except the above, can be given for the rules of AM., while many are given for the rules of OS. and NS. This calendar can probably be found in the libraries of Theological Institutions, and certainly in Greece. It may differ in form as indicated in AC. Note 112. But it will doubtless be substantially the same, since the "Metropolitan of Kiev" must be regarded as the highest authority. And the fact that AM., as he states it, is identical with OS., is strong evidence that his statements are correct.

(18). The rule "To find the Hagion Pascha," copied by photo-engraving, is appended. This differs from ordinary print, about as much as our manuscript differs from print. And Scaliger uses so many contractions in his Greek, that it differs quite as much from ordinary print. And he introduces without translation, sentences in Greek, Hebrew, Arabic, etc., as parts of his Latin text. And his work printed in 1629, was not very long after the time that a Greek sentence was omitted by the Latins, with the note: "Græcum est, non legitur"—"It is Greek, it is not read."

Του ευρίσκειν το Άγιον Πάσχα

Εάν θέλης να μάθης πότε γίνεται το Άγιον Πάσχα, χρειάζεται πρώτον διά της Ερμηνείας (1), να εύρης τον Κύκλον της Σελήνης του ζητουμένου Χρόνου, και έπειτα να σκεφθής το Κανόνιον (2), όπου εσημειώθη το Νομικόν Φάσκα με τον Κύκλον της Σελήνης. Ούτω με την Ερμηνείαν (3), ευρίσκεις από ποίαν ημέραν αρχινά ο Μήνας του Νομικού Φάσκα από αυτήν μετράς έως εις το τέλος των ημερών του αυτού Νομικού Φάσκα εις ποίαν ημέραν τελειώνει, και η πρώτη Κυριακή όπου ακολουθεί είναι το Άγιον Πάσχα.—

Παραδείγματος χάριν εις το έτος 1851 έχομεν κύκλον της σελήνης 6, ο οποίος εις το έμπροσθεν Κανόνιον (2), αντικρύζει με την 7. Απριλίου. Κατά την Ερμηνείαν ανωτέρω (1) ο Απρίλιος άρχισεν Κυριακή. Λοιπόν μετρούντες από αυτήν τας ημέρας του Απριλίου, βλέπομεν ότι η 7. του Μηνός αυτού είναι Σάββατο, καθ' ην ήτο το Νομικόν Φάσκα όθεν την εφεξής Κυριακήν, ήτοι την 8 του Απριλίου έχομεν το Άγιον Πάσχα.

Ιερεύς Αγάπιος Τουλσαρέζκο.

AU.*

AU=AUC=Anno Urbis Conditæ=Year of the City Constructed=old Roman year.

AU. Rule 1. For the year JP., add 3960 to the year AU.

1. The early Roman dates are so uncertain that rules for positive dates within the year cannot be constructed. Romulus began his year in JP. 3961 with March. Then followed April, May, June, then Quintilis which was changed by Julius Cæsar to July. Then Sextilis, which was changed by Augustus to August, then as we have them at the present time, Sept., Oct., Nov., Dec. All except the first four months, from Quintilis (fifth) to December (tenth), being numbered from March as the first. It is a disputed point whether January and February made up the 12 months, or whether the year of Romulus contained only 10 months. Jarvis (pp. 55–65) recites authorities to prove that it contained 12 months. And he supposes that the date had receded about 10 days, when in AU. 39 Numa modified the calendar of Romulus, confessedly on a Greek basis, and made January the first, the beginning of the year.

2. Adams' Roman Antiquities (pp. 353, 355) says: "Numa in imitation of the Greeks divided the year into 12 months according to the course of the moon consisting of 354 days: he added one day more (Plin. 34.7) to make the number odd. . . . . The Romans divided their months into three parts by Kalends, Nones, and Ides. The first day was called Kalendœ vel Calendœ (a calendo vel vocando) from a priest calling out to the people that it was new moon . . . . . the 13th Idus the Ides from the obsolete verb *iduare*, to divide, because the Ides divided the month."

3. Now: In the absence of positive knowledge, we may infer that "the obsolete verb *iduare*" has been invented to agree with the fact that "the Ides divided the month." These names Kalends and Ides, with the facts that Numa divided the year into 12 lunar months, and changed the beginning of the year from 1st March to 1st January, indicate that Romulus adopted the calendar of a Greek colony, which counted 12 actual lunations in the year, as the Turks do at present (ME.). We know that the Greeks so understood the oracle, that the first day of the month must be the day of the actual new moon (OE.). The classic Greeks called this Noumenia or new moon. The Romans called it Kalendœ, which is certainly from the Greek *Kaleo*, to call out or proclaim. Kalendœ being from the Greek, we may infer that Idus is from the Greek *Eido* (pronounced Ido) to see or observe.

4. Now: it is an astronomic fact, that if at the Idus, an Observation (Eido) be

* See NS. Preface.

taken to determine how many hours before or after midnight was the time of full moon, the number of days to the next new moon can be determined. Hence the inference that at the Idus the priest took an Observation (Eido) of the hour of full moon, and then proclaimed (Kaleo) how many days it would be to the next new moon, and the beginning of the month. And this Proclamation (Kaleo) made day after day, caused the Kalends to count backwards. In like manner the Greeks as far back as the time of Homer counted backwards from the beginning of the next month, but with this difference, the Greeks specified, that it was so many days before the "Lost Moon" (OE.) The Romans simply called it a Proclamation (Kaleo) leaving the rest to be inferred.

5. This supposes that the date was determined by actual observation analogous to the Mosaic rule among the Hebrews (HC.). Then a year of 12 mean lunations would recede 10.875,148 days per year. This multiplied by 38 years from Romulus to Numa=413.25 days or one year and 48 days. If Numa postponed the change one year, then the 1st Jan. fell within one day of the same equinoxial date, as the 1st March when established by Romulus, as the beginning of the year.

6. Numa added one day to 354 (Plin. 34.7), says Adams (p. 353). This left about 10 days intercalation to retain the same solar date. The Pontifex Maximus threw in these extra days according to his own judgment (*arbitrio*). These were inserted between Feb. 24 and Feb. 25. The one day intercalary in the bissextile of the Julian Calendar (JE.) has the same position. The Church of Rome retains the same position. But others changed it to February 29 at the Savoy Conference in AD. 1660. And it has been legally decided that the intercalary is a part of the previous day in counting ages. And since Feb. 24 is in Roman terms "Sextum Kalendas Martii" (JE.), this extra Feb. 24 is called "Bis-sextum Kalendas Martii," and the year in which it falls is a Bissextile, and thus differs from a Leap year with Feb. 29 as the intercalary.

7. These intercalaries were thrown into the calendar of Numa with such irregularity that no dependence can be placed upon Roman dates until AU. 707 Oct. 13. Sosigenes after framing JE., calculated the date backwards over the last "year of confusion." He divided 445 days into 15 months beginning Oct. 13 AU. 707, and ending Dec. 31 AU. 708, the day before Jan. 1 AU. 709. This is called the "Proleptic (or before taken) Julian year." But why it should have a Greek name is not obvious, since proleptic is Greek and not Latin.

8. Thus, through more than 26 centuries the calendar of Romulus has sent down to us his names of the months except two of the numbered months, and all the numbered months counting from March, which was named after Mars the father of Romulus, who was deified as the God of War. (JE.)

Notes respecting the following Cycles.*

1	2	3	4	5	6	7	8	9	10	11	12	13
January GND.	GND.	AU. NGN. of BC. 45.	NC. NGN. (of 5th Century) CP. 1715.	NGN. of CP. 1607.	NGN. of CP. 1553.	AM. NGN. Modern.	Epacts for NS. NGN. (Missal) of AD. 1582.	Epacts for NS. FGN. (NS. 3) of AD. 1874.	Epacts for AC. NGN. of AD. 1874.	Epacts for AC. FGN. of AD. 1874.	OS. FGN. of AD. 534.	AM. FGN. of AD. 534.
67	March 8	14	16	2	2	18	23		23			
68	“ 9	3	5		10	7	22		22			
69	“ 10			10			21		21			
70	“ 11	11	13		18	15	20		20			
71	“ 12		2	18	7	4	19		19			
72	“ 13	19		7	15		18		18			
73	“ 14	8	10			12	17		17			
74	“ 15			15		1	16		16			
75	“ 16	16	18	4	4		15		15			
76	“ 17	5	7		12	9	14		14			
77	“ 18			12			13		13			
78	“ 19	13	15	1	1	17	12		12			
79	“ 20	2	4			6	11		11			
80	“ 21			9	9		10	23	10	23	16	13
81	“ 22	10	12		17	14	9	22	9	22	5	2
82	“ 23		1	17	6	3	8	21	8	21		
83	“ 24	18		6	14		7	20	7	20	13	10
84	“ 25	7	9			11	6	19	6	19	2	18
85	“ 26			14			5	18	5	18		
86	“ 27	15	17	3	3	19	4	17	4	17	10	7
87	“ 28	4	6		11	8	3	16	3	16		
88	“ 29			11			2	15	2	15	18	15
89	“ 30	12	14		19	16	1	14	1	14	7	4
90	“ 31	1	3	19	8	5	*	13	*	13		
91	April 1	9		8	16		29	12	29	12	15	12
92	“ 2		11	16		13	28	11	28	11	4	1
93	“ 3	17		5	5	2	27	10	27	10		
94	“ 4	6	19				26(25)	9	26	9	12	9
95	“ 5		8	13	13	10	25,24	8	25	8	1	17
96	“ 6	14	16	2	2		23	7	24	7		
97	“ 7	3	5			18	22	6	23, 22	6	9	6
98	“ 8			10	10	7	21	5	21	5		
99	“ 9	11	13		18		20	4	20	4	17	14
100	“ 10		2	18	7	15	19	3	19	3	6	3
101	“ 11	19		7		4	18	2	18	2		
102	“ 12	8	10		15		17	1	17	1	14	11
103	“ 13			15		12	16	*	16	*	3	19
104	“ 14	16	18	4	4	1	15	29	15	29		
105	“ 15	5	7				14	28	14	28	11	8
106	“ 16			12	12	9	13	27	13	27		
107	“ 17	13	15	1			12	26(25)	12	26	19	16
108	“ 18	2	4		1	17	11	25,24	11	25	8	5
109	“ 19			9	9	6	10		10	24		

Examples of different Golden Numbers and GN. Dates; and corresponding Epacts with explanations, numbered as the columns. (AC. Note 106.)

3. and 3d column. AU. NGN. were introduced with AU. or Julian Calendar at

* See NS. Preface.

the date of new moon BC. 45, Jan. 1, and have Jan. 1 = GN. 1; which makes the Basic year = BC. 45, and AD. 325 = GN. 9, dated April 1. This is the first appearance of the Scale (NB. Scale). Contra. Jarvis (p. 95) supposes AD. 325 = AU. GN. 3.

4. NC. NGN. (NB. NC.) has GN. 3 = March 31 and new moon fell AD. 325, March 31 (MDK.) This makes AD. 325 = GN. 3, and the Basic year = BC. 1, as at present, and for all intermediate Calendars except for (AM. GN.) Also, new moon in AD. 325 = April 1, by AU. GN. and March 31 by NC. GN., shows that NC. in modifying the Basic year of AU. GN. from BC. 45 to BC. 1, also subtracted one day for the recession of the moon, which is one day in 308 Julian years. This is the lunar portion of NC. (NB. NC.) Contra. Jarvis (p. 95) says that new moon fell AD. 325, March 23, and hence AD. 325 = GN. 1. This discrepancy between AU. GN. and NC. GN., as stated by Jarvis, caused an investigation which formed the nucleus around which the whole of this work on Calendars and Almanacs has been crystalizing for the last ten years. Also, Jarvis (pp. 87–92) says that NC. GN. were "established by the Council of Nice." Contra. (NB. NC.) (AC. Note 54.)

5. NGN. of CP. 1607, by taking the Basic year = BC. 1, shows 4 days recession from NC. NGN. (CP. 1607 = Common Prayer Book of 1607.)

6. NGN. of CP. 1553 is very irregular, but taking the basic year = BC. 1 shows about 4 or 5 days recession from NC. NGN. (CP. of Edward VI.)†

7. AM. NGN. have the basic year = AM. 1 (AM.), and make AD. 325 = AM. NGN. 19. To convert AM. NGN. or AM. FGN. into the western GN. from JP., add 3 or subtract 16 years. These then show a recession of 4 and 5 days from NC. NGN.

8. (1.) Epacts for NS. NGN. in the Missal have * at each NC. NGN. 3, representing AD. 325. Then epacts in reverse order from 29 to 1 between * and *, with doubled epacts 25 (25) regular and extra in all spaces of 30 days from * to *, and doubled epacts 26 (25) regular and extra; and 25, 24 regular in spaces of 29 days (as seen at April 4, 5), and epacts 20, 19 doubled at Dec. 31, with the note. "This epact 19 is not to be used except in the year of the Golden number 19."

(2.) Now any epact with its permanent date being assumed as the epact for any GN., will strike the same dates in the year as that GN. by Scale, including NS. Retractions. Hence by changing the epact for any GN. the date of that GN. is changed by the use of this "immutable system of epacts," and there is no necessity of changing the table in order to follow the moon as in (columns 5, 6, 7). Thus, during this century NS. Key epact = 19, and hence GN. 3 = epact 22 = April 7, in Epacts for NGND = 7 days later than GN. 3 = March 31 in NC. NGN; or 5 days recession by NS. LC., and 12 days advance by NS. SC., making 7 days advance. The same change is produced by the NS. Index in the Anglican Table II. applied to NS. Table III. (NB. NS. 32).

9. *Epacts* for NS. FGND. This is original. The dates are found by adding 13 days to the Epacts for NGND. on or between March 8 and April 5 (= new moon of Nisan) to find FGND. of 14th Nisan. (NB. NS. 3; Table III.)

10. *Epacts* for AC. NGN. shows the changes of (column 8) to meet (NB. AC. 3, 26).

11. *Epacts* for AC. FGN. are found from (column 10) in the same manner as (col. 9 from col. 8).

12. OS. FGND. are found by adding 13 days to the dates of NC. NGN. to give the 14th Nisan in accordance with the compromise (NB. NC.) These were established by the Council of Chalcedon, AD. 534, "to find Easter for ever." (Wheatly, p. 38.)

13. AM. FGN. Reduce AM. FGN. to JP. FGN. by adding 3 or subtracting 16 years, and AM. FGND. becomes identical with OS. FGND. Hence AM. is only the Greek form of OS.

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† The first C.P. of Edward VI. in AD. 1549, has GN. by scale from GN. 5 = March 8 to GN. 4 = April 18.

HC.*

HC.=HEBREW CALENDAR (MODERN).
HCM.=HC. MOSAIC (ANCIENT).

Summary.

The HC. Rules here given are more simple than elsewhere found. They are in precise accordance with the standard rules by Characters. The HC. Table of dates from AD. 1883 to AD. 1902, is substantially the same as given by Lindo in his "Jewish Calendar for 64 Years" They are required by the historian to determine dates since AD. 1040, when this calendar was generally adopted. And its lunar dates are wonderfully accurate. But in the use of those dates there are several departures from the ancient rules. So that in determining ancient dates the historian requires the rules of HCM., with the following differences.

1st. HC. makes Nisan begin *before* conjunction, and the Passover to fall on the same day as full moon or the day before full moon. These were impossible under the Mosaic rule.

2d. HC. makes the Passovers fall on the day of the *second* full moon after the vernal equinox in each of the three years preceding GN. 1, 9, 12, since AD. 1630 and GN. 4 will follow in AD. 1972. It thus makes the whole series of 19 Passovers advance a lunar month in 6501 years, and thus keep revolving through all seasons to the end of time.

3d. HC. does not allow the Passovers to fall on Day ii, iv, vi. By the Mosaic rule there was no restriction.

4th. HC. changes the number of days in Hesvan and in Kislev, to restrict the number of days in the year, to 353, 354, 355, 383, 384, 385. By the Mosaic rule there were no such changes.

The HCM. Table of dates from AD. 1883 to AD. 1902, compared with the HC. Table of dates, will illustrate the present differences as to 1st and 2d, which are astronomic, while retaining the 3d and 4th, which are artificial.

HCM. Example of the last sacrifices in the temple AD. 70, April 14, prove 1st above.

HC. and HCM. Examples from AD. 28 to AD. 34 illustrate the application of the rules of HCM. in determining which of the six years assigned by different authors was the actual year of the Crucifixion.

Contradictions are numerous. The specific points are stated in the Table of Contents at the beginning of the notes. Then follow the Authors.

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* See NS. Preface.

HC.

HEBREW CALENDAR.

HC. Rule 1. For the beginning of the year and day. Add 3761 to the year AD. or subtract the year BC. from 3762. Or subtract 952 from the year JP. And for the year AD. subtract 3761 from the year HC.; or for the year BC., subtract the year HC. from 3762; or for the year JP. add 952 to the year HC.—And this year HC. begins with the first day of Tisri, which begins in Hebrew time in the evening *before* noon of the day of the month and of the week as found by rule, in September or October. And this first day of Tisri determines all the Hebrew dates of the previous and of the current year, which fall in the same year AD., BC., or JP. And all count in Hebrew time from the evening *before* noon, of the day of the month and of the week as found by rule.

HC. Rule 2. For the character of Moled Tisri: Divide the year HC., by the circle 19 for Q of past cycles, and R=GN. Then multiply separately the three terms of a cycle 2..16..595, by Q. And multiply the three terms of an embolismic year 5..21..589 by as many embolismic years as are *before* the given GN., counting GN. 3, 6, 8, 11, 14, 17, 19 as embolismic. And multiply the three terms of a common year 4..8 876 by as many common years as are before the given GN., counting as common years GN. 1, 2, 4, 5, 7, 9, 10, 12, 13, 15, 16, 18. Then to the sums of the multiples of these three terms, add the three terms of the standard character 2..5..204, and reduce thus:

Divide the sum of the third terms (scruples) by 1080 for Q of hours and R of scruples. Then add Q of hours to the sum of the second terms (hours), and divide this sum by 24 for Q of days, and R of hours. Then add this Q of days to the sum of the first terms (days) and divide by the circle 7, for R of days. And the R of days, and R of hours, and R of scruples, is the character of Moled Tisri, or the day of the week, and the hour, and the scruples, upon which falls the new moon of Tisri, counted in Hebrew time from six hours before midnight at Jerusalem.

Or. Divide the year HC. by the circle 19 for Q of past cycles and R=GN. Then multiply Q into the three terms of a cycle 2..16..595, and to these products add the three terms of the standard date 2..5..204. Then reduce these terms as above to find the character of GN. 1, of the current cycle. Then by HC. Rule 8 find by progression, the character of Moled Tisri, for each of the 19 years in that cycle. (BA.)

HC. 1st Ex. AD. 1901+3761=HC. 5662;÷circle 19=Q 297+GN. 19. Then (2..16..595)×297+(5..21..589)×6 embolismic+(4..8..876)×12 common+2..5..204 standard=674 days..4979 hours..190,965 scruples=vi..19..885=character of Moled Tisri AD. 1901=GN. 19.

HC. 2d Ex. Or (2. 16..595)×297+2..5..204=596..4757..176,919=III..0..879 the character of Moled Tisri of GN. 1=AD. 1883. Then by Rule 8—as in HC. Table AD. 1883 to 1902.

HC. Rule 3. For the ferial of 1st Tisri: Make it the same as the ferial of Moled Tisri, except in the following cases, add as directed.

J=*Jach*=18 hours. If the date be as much as 18 hours, then add one day for the date of 1st Tisri.

B=*Betuthakphat*=II..15..589. If the character of a common year, next after an embolismic year be II..15..589 or more, then add one day.

G=*Getrad*=III..9..204. If in any common year the character of the Moled be III..9..204 or more, then add two days.

A=*Adu*=i, iv, vi. If in any case the 1st Tisri would fall on Day 1, iv, or vi, then add one day.

JA=*Jach* and *Adu* combined, add two days.

HC. Rule 4. For the lengths of years and months: In a circle of 7, subtract the ferial of the 1st Tisri of the given year, from the ferial of the 1st Tisri of the following year, and let the remainder iii, iv, v in a common year be represented by s, o, l (short, ordinary, long) and the remainder in an embolismic year v, vi, vii= S, O, L, then will the number of days in the given year, and the days in the months in that year, be as follows:

	Golden Numbers.	Difference of Ferials.	Short, Ordinary, Long.	Days in the Year.	1 Tisri.	2 Hesvan.	3 Kislev.	4 Tebet.	5 Sebat.	6 Adar.	Veadar.	7 Nisan.	8 Yiar, Zif.	9 Sivan.	10 Tamuz.	11 Ab.	12 Elul.
Common years.	1, 2, 4, 5, 7, 9, 10, 12, 13, 15, 16, 18	iii	s	353	30	29	29	29	30	29		30	29	30	29	30	29
		iv	o	354	30	29	30	29	30	29		30	29	30	29	30	29
		v	l	355	30	30	30	29	30	29		30	29	30	29	30	29
Embol years.	3, 6, 8, 11, 14, 17, 19	v	S	383	30	29	29	29	30	30	29	30	29	30	29	30	29
		vi	O	384	30	29	30	29	30	30	29	30	29	30	29	30	29
		vii	L	385	30	30	30	29	30	30	29	30	29	30	29	30	29

HC. Rule 5. For Ecclesiastical Days: 1st Tisri=Rosh Ashana=New Year. 10th Tisri=Kipur=Day of Expiation. 15th Tisri=Succot=Feast of Tabernacles. 21st Tisri=Hosana Raba, *i. e.*, Great=last day of the festival. 25th Kislev= Hanuca=Feast of Dedication. 14th Adar or Veadar=Purim. 1st Nisan=ancient New Year, and present beginning of the ecclesiastical year. 15th Nisan=first day of the Passover. 6th Sivan=Sebuot=Pentecost=Feast of Weeks. And these all begin in the evening *before* noon of the dates found by rule.

HC. Rule 6. To simplify HC. Rule 2 (BA). For the year HC. add 3761 to the year AD.; or subtract the year BC. from 3762, or subtract 952 from the year JP. Then divide the year HC. by the circle 19 for Q of past cycles and R=GN. Then multiply Q by 1565 and subtract the product from GND. of the given GN. for 2d R. Then subtract one from the year HC., and divide the remainder by 4, and multiply the new remainder by 6480 to find JCC., which add to 2d R. Divide this sum by 25,920 for Q=day of August OS., and R=scruples. Divide the scruples by 1080 for Q=hours and R=scruples. Then if desired multiply the scruples by $3\frac{1}{3}$, and divide the product by 60 for Q=minutes, and R=seconds. If the day of August OS., exceed 31, then subtract 31 for R=day of September OS. If it exceed 61, subtract 61 for R=day of October OS. If date NS. be desired then add NS. SC. (12 days from March 1, 1800, to March 1, 1900, then 13 days to March 1, 2100, etc.)

GN.	GND.
1	1,768,164
2	1,486,080
E 3	1,203,996
4	1,687,345
5	1,405,261
E 6	1,123,177
7	1,606,526
E 8	1,324,442
9	1,807,791
10	1,525,707
E 11	1,243,623
12	1,726,972
13	1,444,888
E 14	1,162,804
15	1,646,153
16	1,364,069
E 17	1,081,985
18	1,565,334
E 19	1,283,250

HC. Ex. AD. 1883+3761=HC. 5644;÷19=Q 297+GN. 1. Then 297×1565 from 1,768,164=2d R 1,303,359. Then HC. 5644−1;÷4 leaves 3;×6480=19440 JCC.;+1,303,359=1,322,799;÷25,920=Q 51 Aug. OS..+0 hours..879 scruples. Add 12 days NS. SC.=Date of Moled Tisri AD. 1883..Oct. 2..0 h..879 scr. (See HC. Table.)

HC. Rule 7. For the ferial of Moled Tisri: Subtract one from the year HC., and divide R by 4 for Q and 2d R. Then multiply Q by 5, and to P, add 2d R, and the constant 4, and the day of August OS. (found by HC. Rule 6) and divide S by the circle 7, and R=the ferial.

HC. Ex. AD. 1883=HC. 5644;−1=5643;÷4=Q 1410+R 3. Then 1410×5+3+4+51=7108;÷7 leaves ferial III. (See HC. Table.)

HC. Rule 8. *To tabulate Dates.*—Prepare a blank table similar to the table of examples AD. 1883 to AD. 1902. At the heads of the columns put the following: Col. 1=any year AD. Col. 5=corresponding year HC. by rule 1, or 6. Col. 7=GN. found by rule 2, or 6. Col. 6=day of the month, and Col. 8=hours and scruples found by rule 6, and ferial found by rule 7, to complete the character of Moled Tisri in the corresponding year HC. Then prove this work in Col. 8, by finding the same character by rule 2. Then set down in consecutive order the years AD. HC. and GN., marking with L, the NS., Leap years (which AD. 1900 is not), and with E, the embolismic GN. as in rule 2 or 6. This completes the skeleton.

For Col. 8. E=v..21..589 and C=iv..8..876;=Character of an Embolismic (E), and of a Common (C) year. Then if the year of which the character has been found be E (or C) add the character v..21..589 (or iv..8..876), and reduce as in rule 2 to find the character of Moled Tisri of the next year. To prove the work, add ii..16..595 to the character of any GN. and reduce to find the result the same as the character of the same GN. in the next cycle.

For Col. 9. By rule 3 find the proper symbols J, A, JA, B, G.

For Col. 10. Add to the ferials in Col. 8 the number indicated in Col. 9. In all other cases mark the same ferial as in Col. 8.

For Cols. 11, 12, fill out by rule 4. Then will Cols. 5, and 7 to 12, contain quantities which are exclusively Hebrew, without reference to any other calendar. And all the other dates can be found by rule 5.

For date NS. in Cols. 6, 8, omitting the ferials. If the year for which the date has been found be E, then add 18 d..21..589 and reduce as above, except retain the sum of days (and it simplifies the work to call Oct. 2=Sept. 32). Then subtract one day if the next year be L, but nothing if it be not L.

If GN. be not E, then add 0 d..8..876 and reduce. Then subtract 12 days if the year AD. for which the new date is desired be L, or subtract 11 days if not L.

Rule 9. *For Ecclesiastical Dates.*—For the date of the 1st Tisri (Col. 13) add to the date of Moled Tisri as many days as rule 3 adds to its ferial. Then, from the date of 1st Tisri (Col. 13) subtract 193 days for the 14th Adar or Veadar=Purim; or 177 days for 1st Nisan (ancient New Year's day); or 163 days for the 15th Nisan=first day of the Passover; or 113 days for 6th Sivan=Sebuot=Pentecost. These are all in the previous year HC., but depend upon the 1st Tisri. Then to the date of 1st Tisri add 9 days for 10th Tisri=Day of Atonement; or 14 days for 15th Tisri=Feast of Tabernacles; or 20 days for 21st Tisri=Hosana Raba. Then for 25th Kislef add 83 days if the year be s, or S, or o, or O; but 84 days if it be l, or L, by rule 4.

HC. TABLE.

HC. Examples AD. 1883 *to* 1902.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Year AD. L=NS. Leap Year.	14th Adar or Veadar Purim. Rules 5, 9.	15th Nisan. 1st day of Passover. Rules 5, 9.	6th Sivan. Pentecost Sebuot. Rules 5, 9.	Year HC. Rule 2.	Day of the Month, Moled Tisri. Rules 6, 8.	Golden Numbers. E=Embolismic.	Character of Moled Tisri. E=V..21..589. C=IV..8..876. Rules 2, 6, 7, 8.	Transfers. Rule 3.	Ferials 1st Tisri. Rule 3.	S, s=Short; O, o=Ordinary; L, l=Long. Rule 4.	Days in the Year. Rule 4.	1st Tisri=Rosh Asbana, New Year. Rules 5, 9.	25th Kislev=Hanuka, Feast of Dedication. Rules 5, 9.
1883	Mar. 23	April 22	June 11	5644	Oct. 2	1	iii.. 0.. 879		iii	o	354	Oct. 2	Dec. 24
1884 L	" 11	" 10	May 30	5645	Sept. 20	2	vii.. 9.. 675		vii	l	355	Sept. 20	" 1
1885	" 1	Mar. 31	" 20	5646	" 9	E 3	iv..18.. 471	J	v	L	385	" 10	" 3
1886	" 21	April 20	June 9	5647	" 28	4	iii..15..1060	G	v	o	354	" 30	" 23
1887	" 10	" 9	May 29	5648	" 18	5	i.. 0.. 856	A	ii	s	353	" 19	" 11
1888 L	Feb. 26	Mar. 27	" 16	5649	" 6	E 6	v.. 9.. 652		v	L	385	" 6	Nov. 29
1889	Mar. 17	April 16	June 5	5650	" 25	7	iv.. 7.. 161	A	v	o	354	" 26	Dec. 18
1890	" 6	" 5	May 25	5651	" 14	E 8	i..15..1037	A	ii	S	383	" 15	" 7
1891	" 24	" 23	June 12	5652	Oct. 3	9	vii..13.. 546		vii	l	355	Oct. 3	" 26
1892 L	" 13	" 12	" 1	5653	Sept. 21	10	iv..22.. 342	J	v	o	354	Sept. 22	" 14
1893	" 2	" 1	May 21	5654	" 11	E 11	ii.. 7. 138		ii	L	385	" 11	" 4
1894	" 22	" 21	June 10	5655	" 30	12	i.. 4.. 727	A	ii	s	353	Oct. 1	" 23
1895	" 10	" 9	May 29	5656	" 19	13	v..13.. 523		v	l	355	Sept. 19	" 12
1896 L	Feb. 28	Mar. 29	" 18	5657	" 7	E 14	ii..22.. 319	J	iii	O	384	" 8	Nov. 30
1897	Mar. 18	April 17	June 6	5658	" 26	15	i..19.. 908	J	ii	l	355	" 27	Dec. 20
1898	" 8	" 7	May 27	5659	" 16	16	vi.. 4.. 704	A	vii	s	353	" 17	" 9
1899	Feb. 24	Mar. 26	" 15	5660	" 5	E 17	iii..13.. 500		iii	O	384	" 5	Nov. 27
1900	Mar. 15	April 14	June 3	5661	" 24	18	ii..11.. 9		ii	l	355	" 24	Dec. 17
1901	" 5	" 4	May 24	5662	" 13	E 19	vi..19.. 885	J	vii	S	383	" 14	" 6
1902	" 23	" 22	June 11	5663	Oct. 2	1	v..17.. 394		v			Oct. 2	

1883=iii..0..879+ii..16..595=(cycle)= v..17..394=Proof, rule 8.

Then by rules 5, 9, add 9 days to the date of 1st Tisri for 10th Tisri=Day of Atonement; cr 14 days for 15th Tisri=Succot=Feast of Tabernacles, or 20 days for 21st Tiri=Hosana Raba.

For dates OS., as counted by the Russo-Greeks, subtract 12 days (nominal) from these dates until March 1st, A.D. 1900, and then 13 days. And count the holidays as beginning in the evening *before* noon of these dates.

HCM.

HCM=HEBREW CALENDAR MODIFIED OR MOSAIC.

HCM. Rule 1. Count all the holidays as beginning in the evening *after* noon of the dates found by rule. (22–26.)

HCM. Rule 2. Modify HC. Rule 2, thus . Find the embolismic years corresponding with the given century, by HCM. Rule 6. Then use the present standard date II..5..204 before HC. 5000 (AD. 1239). Then until HC. 11,500 (AD. 7739) subtract a lunation (I..12..793), leaving the standard vii..16..491 as at present, and at each period of 6500 years thereafter, continue to subtract a lunation. (27–33.)

HCM. Rule 3. Count J=*Jach*=10 hours (instead of 18 hours). And B=Betuthakphat II..7..589 (instead of II..15..589). And G=Getrad III..1..204 (instead of III..9..204).

For ancient dates, omit B, G, and A.

HCM. Rule 4. For ancient dates, count Nisan the first month with 30 days, and all the months thereafter alternately 29 and 30 days, except the last month, which depends upon the beginning of the next year. And find the length of each year from the difference of the 1st days of Nisan. (46–53.)

HCM. Rule 5. This is the same as HC. Rule 5, except that all the holidays begin in the evening *after* noon of the dates found by rule. Or one day later, then by HC. Rules 1, 5. (54.)

HCM. Rule 6. Use HC. Rule 6, with the following modifications of the table of GND.

a. Substitute this table for dates on and after HC. 5400 (AD. 1639) until HC. 5700 (AD. 1939).

b. For future years, when HC. year of change of any GN. arrives, then add 6500 to the year of change, and subtract 765,433 from its GND., and remove E from the previous GN. to that GN.

c. For past years, add 6500 to the given year HC., and if the sum be less than the HC. year of change, then add 765,433 to the GND., and remove E from that GN. to the previous GN.

d. In all cases, take E and GND. as in this table, when not changed as by *b*, and *c* above. (63–67, 84–86.)

HC. year of Change.	GN.	GND. from HC. 5400 to 5700, or from AD. 1639 to 1939.
11,500	E 1	1,002,731
7,400	2	1,486,080
9,800	E 3	1,203,996
5,700	4	1,687,345
8,100	5	1,405,261
10,500	E 6	1,123,177
6,400	7	1,606,526
8,800	8	1,324,442
11,200	E 9	1,042,358
7,100	10	1,525,707
9,500	11	1,243,623
12,000	E 12	961,539
7,800	13	1,444,888
10,200	E 14	1,162,804
6,100	15	1,646,153
8,500	16	1,364,069
10,900	E 17	1,081,985
6,800	18	1,565,334
9,200	19	1,283,250

HCM. Rules 7, 8, 9, are the same as HC. Rules 7, 8, 9, except the modifications, by the previous rules of HCM.

HCM. TABLE MODERN.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Years AD. L = Leap Year.	Purim = 14th Adar, or 14th Veadar.	Passover = 15th Nisan.	Pentecost = 6th Sivan.	Year HC.	Day of Month NS. Moled Tisri.	Golden Number E = Embolismic.	Character of Moled Tisri.	Rule 3, symbols.	Ferial of 1st Tisri.	S, s = short; O, o = ordinary; L, l = long.	Days in the Year.	Date NS. of 1st Tisri.	Date of Hanuca.
1883	Feb. 22	Mar. 21	May 13	5644	Sept. 2	E 1	i..12..86	J	ii	S	383	Sept. 3	Nov. 25
1884 L	Mar. 11	April 10	" 30	5645	" 20	2	vii.. 9.. 675	...	vii	l	355	" 20	Dec. 13
1885	" 1	Mar. 31	" 20	5646	" 9	E 3	iv..18.. 471	J	v	L	385	" 10	" 3
1886	" 21	Apr. 20	June 9	5647	" 28	4	iii. 15..1060	JA	v	o	354	" 30	" 22
1887	" 10	" 9	May 29	5648	" 18	5	i.. 0 . 856	A	ii	s	353	" 19	" 11
1888 L	Feb. 26	Mar. 27	" 16	5649	" 6	E 6	v.. 9 . 652	...	v	L	385	" 6	Nov. 29
1889	Mar. 17	Apr. 16	June 5	5650	" 25	7	iv.. 7. 161	A	v	o	354	" 26	Dec. 18
1890	" 6	" 5	May 25	5651	" 14	8	i..15..1037	J	ii	l	355	" 15	" 8
1891	Feb. 24	Mar. 26	" 15	5652	" 4	E 9	vi.. 0.. 833	A	vii	S	383	" 5	Nov. 27
1892 L	Mar. 13	Apr. 12	June 1	5653	" 21	10	iv..22.. 342	J	v	o	354	" 22	Dec. 14
1893	" 2	" 1	May 21	5654	" 11	11	ii.. 7.. 138	....	ii	l	355	" 11	" 4
1894	Feb. 20	Mar. 22	" 11	5655	Aug. 31	E 12	vi..15. 1014	J	vii	L	385	" 1	Nov. 24
1895	Mar. 12	Apr. 11	" 31	5656	Sept. 19	13	v..13.. 523	JA	vii	s	353	" 21	Dec. 13
1896 L	Feb. 28	Mar. 29	" 18	5657	" 7	E 14	ii..22.. 319	J	iii	O	384	" 8	Nov. 30
1897	Mar. 18	Apr. 17	June 6	5658	" 26	15	i. 19.. 908	J	ii	l	355	" 27	Dec. 20
1898	" 8	" 7	May 27	5659	" 16	16	vi.. 4.. 704	A	vii	l	355	" 17	" 10
1899	Feb. 26	Mar. 28	" 17	5660	" 5	E 17	iii..13.. 500	JA	v	S	383	" 7	Nov. 29
1900	Mar. 16	Apr. 15	June 4	5661	" 24	18	ii..11.. 9	J	iii	o	354	" 25	Dec. 17
1901	" 5	" 4	May 24	5662	" 13	19	vi..19.. 885	J	vii	l	355	" 14	" 7
1902	Feb. 23	Mar. 25	" 14	5663	" 3	E 1	iv.. 4.. 681	A	v	....	...	" 4	... .. .

1883 = i..12..86   cycle ii..16..595 = iv..4..681 = Proof.

Then to the date of 1st Tisri, add 9 days for 10th Tisri = Day of Atonement, or 14 days for the 15th Tisri = Succot or Feast of Tabernacles; or 20 days for 21st Tisri=Hosana Raba.

Then count the holidays, as beginning in the evening *after* noon of these dates.

HCM. Example in AD. 70.

Noon of 14th Nisan fell at noon of 14th April AD. 70 as shown by Josephus (104–106). Then by HCM. Rule 6 for past dates, prepare the table for the first

century AD., and AD. 1+3761=HC. 3762 as AD. 101=HC. 3862. To these add 6500 and the sum HC. 10,262 and 10,362 in each case is less than the year of change of GN. 1, 6. 9, 12, 17, so that E must be changed to the previous GN. But they are more than the year of change of GN. 3, and 14, so that these remain unchanged. This makes the embolismic years in the first century AD., to be GN. 3, 5, 8, 11, 14, 16, 19. And these are the same as in HC. Rule 6 except that E. GN. 6 should be E. GN. 5, and E. GN. 17 should be E. GN. 16. Consequently, in the first century AD., HC., takes the same moon as HCM., except in the years GN. 6 and GN. 17. Then by HC. Rule 6:

AD. 70+3761=HC. 3831 ;÷19 leaves GN. 12, which by both rules gives the date of Moled Tisri—Sept. 23..I..23..847. Then HC. makes 1st Tisri=Sept. 24 for two reasons, *first, Jach* adds one day, because the date reaches 18 hours, and *second, Adu* would add one day at any hour because the moled falls on day I. Then HCM. makes 1st Tisri=Sept. 24 because the date reaches 10 hours, but pays no regard to day I. Hence HC. and HCM. agree in making the 1st Tisri= Sept. 24, and 14th Nisan=April 13. But HC. Rule 1, makes noon of the 14th Nisan fall at noon of April 13 contrary to the historic fact, while HCM. Rule 1, makes noon of 14th Nisan fall at noon of April 14, according to the historic fact. And mean full moon fell at 8 hours 37 m A.M. on April 14, AD. 70. This proves that HCM. Rule 1, is required for ancient dates. (25, 26, 30, 31, 64–67, 76, 104, 105.)

COMPARISON OF HC. AND HCM. AD. 26 TO AD. 37.

TABLE I.—*By the Rules of HC.*

AD.	GN.	15th Nisan Noon.	Moled.	Moled Tisri Character.	Rule 3.	1st Tisri.
26	E 6	March 23..vii	Aug. 31	vii..19.. 662	JA.	Sept. 2..II
27	7	April 10..v	Sept. 19	vi..17.. 171	A.	" 20..vii
L 28	E 8	March 30..III	" 8	iv. 1..1047	A.	" 9..v
29	9	April 17..I	" 26	II. 23.. 556	J.	" 27..III
30	10	April 6..v	" 16	vii.. 8.. 352		" 16..vii
31	E 11	March 27..III	" 5	iv..17 . 148	A.	" 6..v
L 32	12	April 15 III	" 23	III..14. 737	G.	" 25..v
33	13	April 4..vii	" 12	vii..23.. 533	JA.	" 14..II
34	E 14	March 23..III	" 2	v.. 8.. 329		" 2 v
35	15	April 12..III	" 22	iv.. 5.. 918	A.	" 22..v
L 36	16	March 31. vii	" 9	I..14.. 714	A.	" 10..II
37	E 17	March 21..v	Aug. 29	v..23.. 510	JA.	Aug. 31..vii

TABLE II.—*By the Rules of HCM.*

AD.	GN.	15th Nisan 6 P.M.	Moled.	Moled Tisri Character.	Rule 3.	1st Tisri.
26	6	April 20..vii	Sept. 30	II.. 8.. 375		Sept. 30..II
27	7	April 10..v	" 19	vi..17.. 171	J.	" 20..vii
L 28	E 8	March 29..II	" 8	iv.. 1..1047		" 8..iv
29	9	April 17..I	" 26	II..23.. 556	J.	" 27. III
30	10	April 6. v	" 16	vii.. 8.. 352		" 16..vii
31	E 11	March 27..III	" 5	iv..17.. 148	J.	" 6..v
L 32	12	April 14..II	" 23	III..14.. 737	J.	" 24..iv
33	13	April 3..vi	" 12	vii..23.. 533	J.	" 13 i
34	E 14	March 23..III	" 2	v.. 8.. 329		" 2..v
35	15	April 11..II	" 21	iv.. 5.. 918		" 21..iv
L 36	E 16	March 31..vii	" 9	i..14.. 714	J.	" 10..II
37	17	April 19. vi	" 28	vii..12.. 223	J.	" 29..I

TABLE III.—*By HCM. one Lunation later.*

AD.	GN.	15th Nisan 6 P.M.		Moled Tisri Character.	Rule 3.	1st Tisri.
28	E 8	iv		v..14..760	J.	vi
29	9	III		iv..12..269	J.	v
30	10	vii		i. 21.. 65	J.	II
31	E 11	iv		vi.. 5. 941		vi
32	12	III		v.. 3..450		v
33	13	I		II..12..246	J.	III
34	E 14	v		vi..21.. 42	J.	vii

The difference. HCM. removes E from GN. 6 and 17 to GN. 5 and 16, and omits A, and counts J=10 hours instead of 18 hours; and the 15th Nisan as beginning *after* noon of the dates found by rule, instead of the evening *before* noon of the dates found by rule. (77–83.)

HC. NOTES.

HC.=Hebrew Calendar (present). HCM.=HC. Mosaic (in accordance with the ancient rules).

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* The numbers refer to the paragraphs. For general rules, and for astronomic rules under the head MD., see the Appendix, at the end of the work.

114 Lord's Supper—by Ussher.
115 The Seasons—by Ideler.
116–121 Solar Error of HC.—by Michaelis.
122–123 Solar Error of HC.—by Nesselman.
124 30 day month of the Deluge—by McClintock and Strong.
125–126 Date when HC. was constructed—by several authors.
127–130 Prime Meridian of HC.—by Muler.
131 Mosaic date of Easter—by Lindo.
132–134 Signification of *Jach*—by Lindo, Scaliger and Muler.
135–138 Perfection of HC.—by note to Adler.

HISTORY.

139–150 Facts indicate—that the rule established by Moses to determine the date of the Passover was retained until the destruction of the second Temple —that Moses retained the Egyptian mode of counting by months of 30 days. That the present calendar is of Babylonian origin.
151–156 *Contra.* Jahn, Seabury, Josephus.
157–163 Comparison of dates by HC. and HCM. from AD. 1883 to 1903.

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Rev. S. M. Isaacs, a learned Rabbi in New York, to whom I was introduced by a letter by the Rev. Marshall B. Smith, D.D., and who referred me to the best authorities as above, and gave the following additional names which have not been examined, viz.: Hirsh's Horeb, Altona 1837; Jost's Geschichte des Judenthums; R. J. Wanderbar, Immerwerender Kalendar der Juden, Dessau 1854; Edersheim, History of the Jewish Nation, Edinburg 1856; Hertzfeld, Geschichte des Folks Israel, Nordhausen 1857; Munk's Palestine, 1845. And an old almanac of De Sola in Montreal.

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Character.

(**1**). In the present Hebrew Calendar (HC.), and in the present modification (HCM.), a character has three terms, 1st Days, 2d Hours, 3d Scruples (or Chelakim or Helakim) of which 1080=one hour, and each=3⅓ seconds. When character is a measure of time, the first term is the excess of days above even weeks, as in the following:

I..12..793=29 d..12 h..793 scruples=one lunation.
IV..8..876=354..8..876..=Common year of 12 lunations.
V..21..589=383..21..589..=Embolismic year of 13 lunations.
II..16. 595=6939..16..595=Cycle of 235 lunations. (29, 30.)

(**2**). When character represents a date, the first term I to VII=ferial Sunday to Saturday. Thus the standard II..5..204=HC. 1, Oct. 7..Monday..5 h..204 scr. in Hebrew time counted from the beginning of Monday at 6 hours after noon of Sunday, Oct. 6, at Jerusalem. This is called Moled Tohn=Birth of the moon at the Creation=first Moled Tisri=GND. of GN. 1 in HC. 1=Mean conjunction, with wonderful accuracy as determined by calculation. (27–33, 57, 132–134, 137.)

(**3** to **5**). GN,P,Q,R,S. explanation transferred to Appendix.

Other Rules of HC.

(**6**). Maimonides, Scaliger, Muler, Lindo, Nesselman, Sekles, give different rules to simplify the calculations in this "labyrinth" as Nesselman calls it. The present are presented as more simple than either of the others, and so prepared as to be used by *rote* without the necessity of understanding the reasons, which are given below in the form of notes. In all these rules, the smallest measure is a scruple of 3⅓ seconds, and fractions are never used in calendar calculations. But Scaliger (Prol. VI) and (pp. 275–282) says that: "Rabbi Adda, the most ancient teacher of the Jews, ... defines the year to be 365 days 5 h..997 scr. and 48÷76 scruples." And Scaliger (pp. 276–278) gives annual tables with this fraction, and says that Epiphanius writes the name Rabbi Ada. And calculation shows that this length of the year is the 19th part of 235 lunations without a fraction. (7.)

(7). C. H. Slonenski (Crelle of 1844, p. 179) gives a rule in decimal fractions. But these measures cannot be reduced to decimals without interminable fractions which must be increased or diminished to find the result. This may cause the difference of a scruple at the turning-point. And that may cause the difference of a day from the standard rule by characters. And that may be increased to three days by the rules of transfer. Hence a rule in decimals is not reliable, although such extreme cases may never occur. (6.)

The Present Calendar.

(8). "The present calendar is of unknown origin," says Professor Nesselman (Crelle, V. 26, p. 50). This is obviously the fact from the different years assigned as its date. A note to Maimonides (Col. 274) gives the supposed years AD. 353, 369, 424, 525. Scaliger (p. 123) supposes AD. 345. Prideaux (Seabury, p. 72) says AD. 360. Lindo (Introduction) says that some suppose AD. 325 [the year of the Council of Nicea]; that the authors of the Encyclopedia say AD. 360, while others say AD. 500. That the Mishna AD. 180 is the first work we have on calendars. That we take the calculations of Rab. Ada, who was born in Babylon AD. 188. And that from these data Rab. Hillel AD. 352 [?] framed the tables used at this day.

(9). From internal evidence, it appears to have been based upon the solar and lunar facts in AD. 607. But the date of its construction is of no practical importance. The important fact is, that it did not come into general use until AD. 1040, when the Jews were expelled from Asia by order of the Califs, and became scattered through Europe. From that date, the present rules must necessarily be followed to find corresponding dates. But for ancient dates they must be so modified, as to agree with the: (6, 14, 125, 126.)

Mosaic Rule.

(10). Moses gives specific directions, as to what is to be done on the 14th day of the First Month (Ex. xii. 3–6). But he does not specify, how this date is to be determined. Maimonides (Col. 234) believes that the Mosaic rule was handed down by tradition. Ideler (p. 213) says: "From the Talmud and from Maimonides, we see, that during the second temple, the beginning of the month was yet always determined by immediate observation." (12, 25, 26, 76, 87, 88, 94–103.)

(11). As to the specific mode. The first day of Nisan was "consecrated," as the beginning of the year, in the evening *after* the first appearance at Jerusalem, of the new moon, which would bring the full moon of Nisan at the same date as the vernal equinox or within one lunation thereafter. But if clouds obscured the new moon, so that on the day of its calculated appearance, it was not actually seen by two credible witnesses before sunset, then the Sanhedrim postponed the beginning of the year to the next evening. And occasionally when the crops were backward, the Sanhedrim postponed the beginning of the year to the next new moon. See Maimonides, Thesaurus Antiquitatum (Vol. 17, Col. 236, 275). Long's Astronomy (Sec. 1252–1255). Roman Missal (De festibus mobilibus). Scaliger, De Emendatione temporum (pp. 121–135). Crelle, Journal die Mathematik (Vol. 26, p. 50). Brady, Clavis Calandria (p. 295). Jackson's Chronological Antiquities (Vol. 2, p. 20). Ideler, Lehrbuch der Chronologie (p. 213). Jahn's Biblical Archæology (Month). Cruden's Concordance (Month). (66, 87, 88.)

(12). Now: Maimonides (Col. 236) says: "Each month the moon is occulted and

does not appear for about two days, more or less, to wit, at the conjunction with the sun before the end of the month. Then again it is seen in the evening in the West. But in the night in which the moon first appears after its occultation, from that the beginning of the month is counted." And (Col. 234) he believes this to be the Mosaic rule. And Scaliger (Prol., p. 7) says that the moon rarely appears before the second day after conjunction. And Newton and Smyth, say that the moon has never been seen earlier than 18 hours after conjunction. And since full moon is 14 days 18 hours after conjunction, Nisan could not possibly begin before 18 hours after conjunction. Nor could full moon fall later than the end of the 14th Nisan. These are astronomic dates to be determined by astronomic rules, as follows. (Newton, Vol. 5, p. 394; Smyth, Vol. 1, p. 123.)

Hebrew Lunar Dates.

(**13**). All Hebrew lunar dates are—or may be—determined, by the constant addition of a lunation of 29 d..12 h..793 scr. to the standard date HC. 1, Oct. 7..5..204. And the date of any new moon in any year, can be found by adding such lunations to the date of Moled Tisri found by rule. In AD. 607, HC. makes the date of Moled Tisri Aug. 28..16 hours exactly, while MDB. makes the date of mean new moon counted in Hebrew time from 6 hours before midnight at Jerusalem,=Aug. 28.668,798=3 min. 4 sec. more than 16 hours. This proves that in AD. 607, the date of Moled Tisri, is the date of mean conjunction counted in Hebrew time from 6 hours before midnight at Jerusalem, and that 18 hours signifies mean conjunction falling at noon of the day of the month and of the week found by rule. (14, 18, 56–58, 125, 126.)

(**14**). The date of Moled Tisri is assumed to be in all cases the date of mean conjunction in Hebrew time, although there is a slight difference from the latest determination of the length of a mean lunation. The HC. lunation of 29..12..793 is less than half a second (0.432) per lunation, or less than 5½ seconds (5.3432) per year more than 29.530,589. Starting from AD. 607, this makes the dates earlier when going backwards, and later in going forwards. Thus in AD. 33, HC. makes the date of Moled Tisri Sept. 12..23..533. And MDB. makes the date of mean conjunction in Hebrew time, Sept. 13.017,487. So that HC. makes the date 55 m. 34 sec. earlier than MDB. Then AD. 1883, HC. makes the date of Moled Tisri= Oct. 2..0..879. Subtract 6½ lunations, leaves full moon March 24..2..44, or March 24..2 h..2 m..27 sec., while MDB. gives the date of mean full moon= March 24.006,156=March 24..0 h..8 m..52 sec. So that in AD. 1883, HC. makes the lunar date=1 h..53 m..35 sec., more than by MDB., while in AD. 607 it was 3 m..4 sec. less. And MDB. is proved to be correct. This makes the HC. lunation come so near to the latest determination, that the lunar dates by HC., are assumed to be perfect for all time, and when practicable are used instead of the dates by MDB., to prove the necessity of the modifications by HCM. And this wonderful lunar accuracy at the early date of Rab. Ada (or Adda), who was born in Babylon AD. 188, and is said to have furnished the data for HC., may be attributed to his access to the records of the Era of Nabonassar (NE.), from which we obtain the date of an eclipse at Babylon 2600 years before AD. 1880, which is used at the present time, to determine the precise length of a mean lunation. (2, 8, MD., 2d Ex. in A.)

Hebrew Solar Dates.

(**15**). No solar date is given specifically in HC. All the dates are lunar, and these are almost perfect. The solar date depends upon the selection of the new

moon 5½ lunations after the full moon which falls on, or next after the vernal equinox, so that the full moon 5½ lunations before the new moon of Tisri shall be the full moon of Nisan, which by the Mosaic rule, must fall within one lunation after the vernal equinox. This solar date is determined by the selection of the proper moon at the beginning of each cycle. Within the cycle the solar date is determined by the arrangement of the embolismic years. And this follows as a necessary consequence, when the date of the earliest moon is determined. (12, 14, 27-33, 49, 55-62.)

(**16**). The earliest solar date in HC., is that of GN. 17. And AD. 607=GN. 17. And in AD. 607, MDB. makes the mean full moon fall 0.014912 day=22 minutes after the mean equinox. Consequently in AD. 607, the whole series of 19 full moons fell within one lunation after the vernal equinox. And the lunar date varied only 3 min. 4 sec. from the mean date of New moon in Hebrew time according to MDB., which has been proved to be correct. So that in AD. 607, both solar and lunar dates agreed precisely with the Mosaic rule. (57, 125, 126, MD. 2 Ex. in A.)

(**17**). But HC., assumes that 235 lunations of 29 d..12..793 are exactly equal to 19 equinoxial years. This makes the solar year 365.246,822 days=365 d..5 h..997 scr.+48÷76 of a scruple, which Scaliger (Prol., p. vi) says that "Rabbi Adda ..defines the year to be." This is 6 minutes 38 seconds more than 365.242,216, the mean year of MDB. And this causes HC. to put the Passovers represented by GN. 6 and GN. 17, in the month Adar (one lunation too early) for the ancient rule in the first century AD., and those represented by GN. 1, 9, and 12 to be one lunation too late since AD. 1630. And the Passover represented by GN. 4 will follow them into the month Zif in AD. 1972. But in consequence of the accuracy of the lunar dates, the mean date of the moon will be given very nearly, whether it be the moon of Adar, or of Nisan, or of Zif. (10–12, 14, 27–33, 63–67, 77, 126.)

Hebrew Equivalents.

(**18**). For Hebrew time counted from 6 hours before midnight at Jerusalem, add 0.348,148 day, to standard time counted from midnight at Greenwich. Then for true mean time by HC., add 1 hour, 53 min., 35 sec. in 1883, and thereafter add 5.3432 seconds per year, to the Hebrew time. (2, 14, 65, 89.)

(**19**). For the date of the new moon of Nisan, subtract 177 d..4 h..438 scr. (6 lunations) from the date of Moled Tisri.

(**20**). For the date of the full moon of Nisan, subtract 162 d..10 h..42 scr. (5½ lunations) from the date of Moled Tisri.

(**21**). For the age of Moled Tisri, subtract the hours and scruples of its date from 24 hours. And for the age of the new moon of Nisan add 4 h..438 scr. to the age of Moled Tisri—because from 1st Nisan to 1st Tisri=177 days, and 6 lunations=177 d..4 h..438 scr.

Explanation of the Rules.

With proofs that the modifications of HCM. are required for ancient dates.

(**22**). *HC. Rule* 1. "The holiday begins in the evening *before* noon of the date found by rule." Maimonides is the only known author who states this distinctly. He says (Col. 280): "If the date fall a moment before noon, the calendar is celebrated on that day." Muler (Col. 55) says, of the standard date II..5..204, that it signifies: "The second day of the week 5 h..204 sc. after 6 hours of the evening,

i. e., after the beginning of the second day." This is shown by current dates in Hebrew almanacs. Lindo says that in 1825 and 1903, the Passover and Easter fall on the same day. In these years Easter falls on the day of full moon. Nesselman says that Passovers fall on the day of full moon. (24, 122, 123, 131.)

(23). *HCM. Rule* 1. "The holiday begins in the evening *after* noon of the date found by rule." Because: Astronomical calculation proves, that with wonderful accuracy, the date of Moled Tisri is the date of mean conjunction in Hebrew time counted from 6 hours before midnight at Jerusalem. And when the Moled falls at 18 hours, mean conjunction falls at noon of the day of the week and of the month found by rule. By HC. Rule 3, the 1st Tisri has the same date as the Moled, if the Moled fall a scruple less than 18 hours, or noon. So that HC. Rule 1, makes Tisri begin a scruple less than 18 hours *before* conjunction. And this makes Nisan begin a scruple less than 13 h..642 scruples *before* conjunction. And it makes full moon fall on the 15th Nisan. These were all impossible under the Mosaic rule. (10–14, 22–26, 36, 76.)

(24). This can be shown by any common almanac as for New York in 1884. Full moon at New York fell April 10th 6 h..48 m. A.M. Add 7 h..17 m. for longitude makes full moon at Jerusalem April 10th..2 h..5 m. P.M. Both HC. and HCM. make the 14th Nisan fall on April 9. By HC. Rule 1, the 14th Nisan begins at 6 P.M. of April 8, and full moon falls 20 h..5 m. *after* the end of 14th Nisan, and hence 20 h..5 m. later than was possible under the ancient rule, while HCM. Rule 1, makes full moon fall 3 h..55 m. before the end of the 14th Nisan, in accordance with the ancient rule. (10–14, 71, 84.)

(25). This result from astronomic calculation is proved to be the ancient rule by the historic statement by Josephus, who was present at the time, and shows that in AD. 70 noon of the 14th Nisan was noon of April 14. Both HC. and HCM. make the 14th Nisan fall on April 13. By HC. Rule 1, the 14th Nisan ended in the evening of April 13, contrary to the historic fact. By HCM. Rule 1, the 14th Nisan began in the evening of April 13 and ended in the evening of April 14, in accordance with the historic fact. (76, 104–105.)

(26). This Passover of AD. 70, was the last that was ever held in the Temple at Jerusalem, when the Hebrews ceased to be a nation. Such a remarkable fact was doubtless subjected to calculation by the unknown author of this calendar. And as doubtless he intended his rules to be interpreted in accordance with HCM. Rule 1. (8, 76, 87–89, 104–105.)

(26½). The Paschal Canons of the 5th century show that the day of full moon was counted the 14th day of Nisan. (AC. Notes 1–11.)

(27). *HC. Rule* 2. "The embolismic years are the same for all time." This assumes that 235 lunations are exactly equal to 19 solar years. (15–17, 27–33.)

(28). *HCM. Rule* 2, finds from the latest determinations that 235 mean lunations are 0.086,311 day more than 19 mean years. Hence a full moon represented by any GN, after becoming the full moon of Adar, advances at the rate of 0.004,542, 68 day per year, and in 6500 years after it became the full moon of Adar, falls at the date of the vernal equinox and becomes the full moon of Nisan. It remains the full moon of Nisan while continuing to advance, for 6500 years, when it passes the limit of one lunation after the vernal equinox and becomes the full moon of Zif, when the next earlier moon in the same year (after keeping the same distance during its advance through Adar), reaches the date of the vernal equinox and becomes the

full moon of Nisan, at the same time that its predecessor reaches the distance of one lunation after the vernal equinox and becomes the full moon of Zif. (13, 14, 17, 30, 31, 63–67.)

(29). Now, HC. is so accurate in its lunar dates, that it will always give the true date of this full moon, whether it be the full moon of Adar, or of Nisan or of Zif. But the Mosaic rule required the date of the full moon of *Nisan*. And by changing the embolismic years, HCM. adopts a full moon as soon as it has passed through Adar and reached the date of the vernal equinox, and 6500 years thereafter, abandons that moon when it becomes the full moon of Zif and substitutes the moon one lunation earlier. (10–14, 63–67.)

(30). In AD. 607, HC. Rule 2 gave the correct dates of all the full moons of Nisan. But at the present time (AD. 1630 to AD. 1927) the full moons represented by GN. 1, 9, 12, fall in the month Zif. And the 16 remaining moons of HC. will follow into the month Zif at the rate of one moon in 342.1 years. Going backwards the case is reversed, and HC. gives the dates of the full moons of Adar at the rate of one moon in 342.1 years. In the first century AD., HC. takes the moons of Adar in the years GN. 6 and GN. 17, while all the others were the moons of Nisan, as shown in HCM. Example AD. 70. And in AD. 70 HC. makes full moon fall 13 h..45 m. after 6 P.M. of April 13, while MDB. makes it more correctly 14 h.. 37 m. This difference is not material. But HC. Rule 1 makes the 14th Nisan begin at 6 P.M. of April 12, so that full moon falls 13 h..45 m. after the end of the 14th Nisan contrary to the ancient rule, and contrary to the fact, as stated by Josephus, who was present at the time. (13, 14, 18, 64–67, 80, 81, 125, 126.)

(31). Josephus wrote his Wars of the Jews in AD. 75. And AD. 75=GN. 17. He states no facts respecting that year to prove that HC. puts the Passover in the month Adar, as determined by the general principle of HCM. Rule 6, and as stated above. This can be proved by independent calculation, thus. HC. makes Moled Tisri fall Aug. 30..8..620, and hence the full moon of Nisan March 20..22..578. MDB. makes that full moon fall March 20.974,938, and the vernal equinox March 23.376,734. So that HC. makes the full moon of Nisan fall 2.401,796 days *before* the vernal equinox. And that by the ancient rule, was the full moon of Adar. (10–12.)

(32). *HCM. Rule* 2, refers to Rule 6 for the changes in the embolismic years, because more evident, since any GN. is necessarily E if the next GND. is greater. But in Rule 6 this indication of an embolismic year is not required, since each GND. is independent of all the others. (57–59.)

(33). *HCM. Rule* 2, subtracts a lunation from the standard date in HC. 5000, and in each 6500 years thereafter. This assumes that the lunar dates by HC., are precisely correct for all time. But it corrects the solar error, by substituting a moon one lunation earlier, when the moon of GN. 1, passes the limit of one lunation after the vernal equinox, and becomes the moon of Zif. This occurred in HC. 5000, or exactly HC. 5049 (AD. 1288). And this change is required only when GN. 1 passes the limit, for by HC. Rule 2, the date of GN. 1 is first found, and this determines the date of each of the 235 moons in that cycle. The changes within the cycle are produced by the changes of E. By Rule 6, for future years, the change of E from the previous GN. to that GN., takes a lunation from the previous GN. and adds it to that GN. and makes that GN. fall one lunation earlier, without affecting the beginning of any other year. The reverse is the case for past

years. And there is no provision for adding a lunation to GN. 1 for past years, since this would only be required 6500 years before HC. 5000 or 1500 years before HC. 1. And these embolismic years are the necessary consequences of the earliest GN. (1, 10–16, 28–32, 58, 59, 65, 66, 125, 126.)

(34). *HC. Rule* 3. Maimonides (Col. 282) gives the rules without the names or explanations, except that 18 hours=noon. Lindo, explains *Adu*. Muler (Col. 82) gives the names and says that they are Hebrew numerals which are used to assist the memory. He says that *Jach*=18 hours, and transfers the date to the next day, but does not explain the reason. Neither does Scaliger explain the reason. Muler (p. 87) and Scaliger (pp. 131–132) explain the reason for *Getrad* and *Betuthakphat*, as below. (132–134, 137.)

(35). *HCM. Rule* 3. Substitute 10 hours for 18 hours=*Jach*. With the present interpretation by HC. Rule 1, the transfer at 18 hours allows the holidays to fall two days earlier than by the Mosaic rule. And by the modification by HCM. Rule 1, 18 hours allows them to fall one day earlier than by the Mosaic rule Thus, when Moled Tisri falls at 18 hours, mean conjunction falls at noon. Then at 24 hours (the end of the day) the moon will be 6 hours after conjunction. The moon of Nisan is 4 h..438 scr. earlier than the moon of Tisri, so that when the new moon of Tisri falls at 18 hours the new moon of Nisan will be 10 h..438 scr. old at the end of the day. And this allows full moon to fall 7 h..1038 scr. after the end of the 14th Nisan. The new moon has never been seen earlier than 18 hours after conjunction. By substituting 10 hours for 18, Nisan cannot begin earlier than 18 h..438 scr., after conjunction. Nor can full moon fall later than the end of the 14th Nisan, with the interpretation of HCM. Rule 1. This adds one day to the dates by HC. if the hour be between 10 and 18. Thus, for example:

(36). In the examples AD. 26 to AD. 37, both rules make the Moled Tisri fall AD. 31 Sept. 5..17..148. Consequently the full moon of Nisan fell 10 hours 974 scruples before noon of March 27. Hence by the Mosaic rule March 27 was the 14th Nisan. Then both rules make the 15th Nisan fall on March 27. But HCM. Rule 1 makes the 15th begin at the end of the day in the evening of March 27, so that noon of March 27 is noon of the 14th Nisan, while HC. Rule 1 makes noon of March 27 to be noon of the 15th Nisan. And it makes the astronomic date the 16th Nisan, but transfers the date one day because the Moled Tisri happens to fall on Day iv.

(37). *Jach* can be obliterated thus: Add 6 hours to the standard date, and to the rules of transfer which depend upon time and to all the GND. in Rule 6. Then 18+6=24 and *Jach* disappears. This would make the date of Moled Tisri count from noon instead of 6 P.M. of the previous day as at present. In like manner, the 10 hour substitute can be obliterated by adding 14 hours instead of 6. Then the date of Moled Tisri would count from 8 hours before noon instead of 6 hours after noon of the previous day. These are actually better because more simple, than the present rules, and the rules were first framed in this form. But the old standards were restored to prevent confusion, when dates by these rules shall be compared with dates by other rules of this, the most complicated of all calendars. But a most interesting study, to determine by calculation, what were the intentions of its unknown author. (2, 8, 34–36, 125, 126, 132–134, 137.)

(38). *HCM. Rule* 3. *Adu*, i, iv..vi. If for any cause the 1st Tisri would fall

on day i, iv, vi, then add one day, to prevent noon of the Passover falling at noon of day ii, iv, vi.

(**39**). Lindo (Introduction) says : "On the same day of the week as the—
1st day of the Passover are the Feasts of Tamus and Ab ; 2d day are 1st day of Sebuot and Hosana Raba ; 3d day are New Year and Tabernacles ; 4th day is Rejoicing of the Law ; 5th day is Kipur, the day of Atonement. Consequently if the first were ii, Purim would be vii and Kipur vi, upon which neither could be observed. If iv, then Kipur would be i, on which it cannot be held, since it has the same strict ordinances as the Sabbath. If vi, Hosana Raba would be vii, a day upon which its ceremonies could not be held." (40, 71–75, 84–86.)

(**40**). *HCM. Rule* 3. For ancient dates, omit *Adu.* Sekles says : "All these reasons for excepting these days of the week for New Year and the Passover, have however not the least foundation either in the Bible or the Talmud. But, on the contrary, it appears from different statements in the Talmud, that during the time of the second Temple, the holidays were celebrated any day of the week, and the only guide to them was the visibility of the Moled, and the exceptions only originated with the introduction of the present system." (38, 76, 82, 83, 87, 88.)

(**41**). *HC. Rule* 3. B=*Betuthakphat*=ii..15..589 (reversed). This adds one day to the date next after an embolismic year to prevent the embolismic year being too short for the artificial restriction to three different lengths, as explained by Müler (p. 87). Thus : If the character of an embolismic year be iii..18 or more add the character of an embolismic year v..21..589 making ii..15..589 or more, as the character at the beginning of the next year. Then, at the beginning JA. transfers iii..18 to v, and at the end, B transfers ii to iii. Then (Rule 4) v from iii =v=index of a short embolismic year of 383 days. It would be 382 days without B. Then :

(**42**). *HCM. Rule* 3. B=ii..7..589. This cuts off 8 hours from B=ii..15..589, to produce the same effect, after cutting off 8 hours from Jach and using 10 instead of 18 hours, for astronomical reasons.

(**43**). *HC. Rule* 3. G=Getrad=iii 9..204 or more, at the beginning of any common year, transfers the date two days to prevent that common year being too long for the artificial restriction to three different lengths. Thus to iii..9..204 or more, add the character of a common year iv..8..876=vii..18 or more. Then G at the beginning transfers iii to v, and JA. at the end transfers vii to ii. Then v from ii=iv, which is the index of an ordinary common year of 354 days. It would be 356 without G.

(**44**). *HCM. Rule* 3. G=iii..1..204 or more. This cuts off 8 hours from iii ..9..204, to produce the same effect after cutting off 8 hours from Jach for astronomical reasons.

(**45**). *HCM. Rule* 3. For modern dates use A=i, iv, vi, and J=10 hours, and B=ii..7..589, and G=iii..1..204. But for ancient dates use only J=10 hours, and omit A, B, G. Sekles says that they were introduced with the present calendar. And it is obvious that B, G, could not have been used when dates were determined by the actual appearance of the new moon of Nisan.

(**46**). *HC. Rule* 4. Count as in the table.

(**47**). *HCM. Rule* 4. For ancient dates count Nisan as the 1st Month, and thereafter the months alternately 29 and 30 days.

(**48**). Professor Nesselman (Crelle, V. 26, p. 50) says : "I know not, when the

beginning of the year was changed to Tisri." Eight of these months are named in the Bible, and six of them count from Nisan as the first, viz.: Nisan 1st (Esth. iii. 7); Zif 2d (1 Kings vi. 1); Sivan 3d (Esth. viii. 9); Elul (Neh. vi. 15); Ethanim (1 Kings viii. 2); Bul 8th (1 Kings vi. 38); Tebeth 10th (Esth. ii. 16); Adar 12th (Esth. iii. 7). (52–53, 112, 149, 150.)

(**49**). This change is nominal. It complicates the rules, but makes no change in the dates. In Bible times the whole year depended on the date of 1st Nisan. Now the whole year depends upon the date of 1st Tisri. But the object of the present calendar, is to give the Mosaic date of the 1st Nisan, by means of the date of the subsequent 1st Tisri, which is uniformly 177 days later, while 6 lunations are 177 d..4..438, so that the moon falls 4 h..438 sc. earlier in Nisan than in Tisri, and its date in Tisri, determines its date in Nisan. (10–12, 15, 21.)

(**50**). The changes in the number of days in Hesvan, and in Kislev, form a part of the artificial arrangement of HC. Rule 3, to keep the years within the artificial limits of six different lengths. Such rules were not required when dates were determined by the actual appearance of the New Moon of Nisan. (10–12, 87, 88.)

(**51**). As to S, O, L and s, o, l, O=vi=the index of an Ordinary embolismic year, because vi comes nearest to the days in the character of an embolismic year =v..21..589. And o=iv=index of an ordinary common year because iv comes nearest to the character of a common year iv..8, 876. And O, o, are called regular, L, l, perfect, and S, s, imperfect years. And months of 30 days are called *full*, and of 29 days *hollow*.

(**52**). These months are known by the following Hebrew names, which fall in two Julian months and two corresponding Macedonian months, of which the first are here given, viz.: 1st, Nisan, Nissan, Abib=March=Dystrus. 2d, Iyar, Ijar, Yair, Yiar, Zif=April=Xanthicus. 3d, Sivan, Siwan=May=Artemisius. 4th, Tamuz, Tammus, Tamus, Thamus=June=Dœsius. 5th, Ab=July=Panemus. 6th, Elul =August=Lous. 7th, Tisri, Tishri, Thisri, Ethanim=September=Gorpiœus. 8th, Hesvan, Chesvan, Marchesvan, Bul=October=Hyperberetœus. 9th, Kislev, Kisluv, Chislev, Caslev=November=Dius. 10th, Tebeth, Tebet, Teveth=December =Apellœus. 11th, Sebat, Shebat, Schebat, Shevat=January=Audynœus. 12th, Adar=February=Peritius. The intercalary Ve Adar, Veadar. (48, 53, 112, 149, 150.)

(**53**). Scaliger (p. 242) gives these Syro-Greek names of the months with their Roman equivalents, and says: "Josephus in his notation of Roman times and affairs, uses the Macedonian names of the Julian months. In all cases, these agree with the Roman months as to the number of days, but differ only in the beginning. The Romans begin from January, but these from Hyperberetœus or October." (52, 112, 113.)

(**54**). *HC. Rule* 5 and *HCM. Rule* 5 are the same, excepting the interpretation by HC. Rule 1 and HCM. Rule 1.

(**55**). *HC. Rules* 6, 7, and *HCM. Rules* 6, 7, are translations of HC. Rule 2 and HCM. Rule 2, into Julian dates, and all the remarks as to principles, apply to them, as in the discussion of HC. Rule 2 and HCM. Rule 2. These rules are original. (27–33, 53–67, 137, 138.)

(**56**). *HC. Rule* 6. Construction of the table. Reduce every quantity to scruples, of which 25920=one day, and 1080=one hour. And 765,433=one lunation of 29..12. 793. (1.)

(57). The standard date Oct. 7..5..204=Aug. 68..5..204=1,768,164 scruples =GND. of GN. 1. Then 12 lunations of 765,433=282,084 less than a Julian year of 365 days 6480 scruples. Hence 282,084 is the epact or the amount that 12 lunations recede per year, in Julian time. Then by authority, GN. 17 is the earliest GN. And GN. 17 is 16 years after GN. 1. Then 16×282,084÷765,433=5 lunations,+ 686,179 earlier than GND. 1. Subtract 686,179 from the standard 1,768,164 leaves 1,081,985 the GND. of GN. 17, and the earliest GN. All the other GND. can be found in the same manner, but each would be independent of all the others, and might be erroneous. The safer mode is to proceed by progression, where the error of one would vitiate all that followed and be shown by the result. Then :

(58). Subtract 282,084 from the GND. of any GN., to find the GND. of the next GN., except this make the GND. less than the limit. In that case add 483,349 (=765,433−282,084), and mark with E, the GND. to which 483,349 is added. Thus continue until the GND. of the original GN. is found. Subtract the GND. of the first, from the GND. of the last and the first must be 1565 more than the last, because 235 lunations of 765,433 scruples are 1565 scruples less than 19 years of 365.25 days, which are called Solar years by Maimonides. (1, 60, 61.)

Limit	1,081,985
Epact	−282,084
	+483,349
GN.	GND.
1	1,768,164
	−282,084
2	1,486,080
	−282,084
E 3	1,203,996
	+483,349
4	1,687,345
E 19	1,283,250
	+483,349
1	1,766,599
1	1,768,164
	−1565

(59). Mark with E, each GN. which preceded the GN. which had a lunation added. Or any GN. is E, if the next GND. be greater. (32.)

(60). Rule 6. Use of the table. The number of past cycles is multiplied by 1565 and the product subtracted from any GND. in that cycle, because the Hebrew lunations recede 1565 scruples per cycle when measured in artificial Julian time. (58.)

(61). Subtract one from the year HC., so that when R is divided by 4, the second R may be JC. 0, JC. 1, JC. 2, JC. 3. Then JC.×6480=JCC., which added to minimum Julian time=calendar (or ordinary) time. And HC. 1, Oct. 7 is JC. 0, after Feb. 29, and therefore minimum Julian time.

(62). "Divide the sum by 25920," *i. e.*, the number of scruples in one day. And before adding NS. SC. it is necessary to know whether at that date and in that nation, dates were counted in OS. or NS. All counted in OS. until Oct. 5–15, AD. 1582. The Russo-Greeks still count in OS., as did the English until Sept. 4–15, AD. 1752. (See NS. Introduction.) (57, 61.)

(63). *HCM. Rule* 6. This table is constructed by progression upon the same principle as HC. Rule 6. Then GND. of GN. 1=1,002,731 is one lunation less than 1,768,164 in HC. And GND. 961,539 of GN. 12 is one lunation less than 1,726,971 of HC. and is the earliest GND. These by progression produce 1,042,358 the GND. of GN. 9=one lunation less than 1,807,791 of HC. And the GND. of

GN. 1, 9, 12 are the only differences between the GND. of HC. and HCM., with the same effect as the changes in Rule 2. Then to show the necessity of these, and other changes, and the years of change, take the following. (28-33, 57, 58, 67.)

(64). *HCM. Rule* 6. *Years of change,* to determine:

19 years of 365.242,216 days=6939.602,104 days. And 235 lunations of 29.530,589 days=6939.688,415 days. The difference 0.086,311 divided by 19= 0.004,542,68 day per year, that a moon represented by any GN. advances in equinoxial time. This into 29.530,589 days=6500.697 years for the full moon of each GN. to advance a full lunation after the vernal equinox, and to become the moon of Zif while the moon one lunation earlier in the same year coincides with the vernal equinox. And 6500 years divided by 19=342.1 years interval between the dates of the different GN. as they pass the limit of one lunation after the vernal equinox. And to find the order in which they pass the limit reverse the rule of GN., and beginning with any GN. continue to add 11 or to subtract 8. And the rule of GN. is to add 8 in a circle of 19, *i. e.*, add 8 or subtract 11, because the next later GND. is 8 years later in a circle of 19 years. (16, 17, 28-33, 58-64.)

AD. year of Coin.	HC. year of Change	GN. E = Emb.	GND. from HC. 5400 to 5700
1288	11,500	E 1	1,002,731
3683	7,400	2	1,486,080
6077	9,800	E 3	1,203,996
1972	5,700	4	1,687,345
4367	8,100	5	1,405,261
6762	10,500	E 6	1,123,177
2656	6,400	7	1,606,526
5051	8,800	8	1,324,442
946	11,200	E 9	1,042,358
3341	7,100	10	1,525,707
5735	9,500	11	1,243,623
1630	11,900	E 12	961,539
4025	7,800	13	1,444,888
6420	10,200	E 14	1,162,804
2314	6,100	15	1,646,153
4709	8,500	16	1,364,069
7104	10,900	E 17	1,081,985
2999	6,800	18	1,565,334
5393	9,200	19	1,283,250

(65). Now, AD. 1883=GN. 1. In AD. 1883 MDB. in Hebrew time gives the date of the vernal equinox=March 21.303,262, and of the full moon=March 24.006,156. The difference 2.702,894 divided by 0.004,542,68 (the advance per year) gives 595 years before AD. 1883=AD. 1288, when the full moon represented by GN. 1 coincided with the vernal equinox. Then to AD. 1288 add continually 342.1 for the successive years of coincidence of the successive GN., and for the corresponding GN., continue to add 11 or to subtract 8 until the original GN. is reproduced at 6500 years after its first date. Then set down in the table these years of coincidence, except for GN. 9 subtract 6500 years, since the date as found is its next year of coincidence. (64, MDT. Mosaic in A.) (AC. Note 37.)

(66). Then for the year of change take the centurial year that is nearest to the year of coincidence, and this will not allow the earliest full moon when it becomes the earliest in the table, to fall as much as 6 hours before or after the vernal equinox. Jackson (V. 2, p. 19) says: "Rabbi Moses Maimonides says, the equinox must be on or before the 15th Nisan." This is here interpreted to signify, that the full moon of Nisan must be on or next after the vernal equinox, because by the present rule the 15th Nisan is the date of full moon. And this interpretation agrees with the dates by the present calendar, as connected with astronomic facts in AD. 607. (10-12, 28-33, 64, 65.)

(67). The result shows that the full moon of HC. represented by GN. 9, passed into the month Zif in AD. 946, and by GN. 1 in AD. 1288, and by GN. 12 in AD. 1630. And GN. 4 will follow in AD. 1972. (17, 28-33, 64, 116-123.)

(68). *HC. and HCM. Rule* 7. "Subtract one from the year HC. and divide R by 4," to cut off the Julian leap year HC. 1 and divide the years into periods of 4,

with the remainder 1, 2, or 3 common years counting 365 days. Then each 4 years contain 1461 days or 5 days more than even weeks, and 365 days are one day more than even weeks. These with the constant 4, and divided by the circle 7 will give the ferial for the 31st of July OS. Then the day of Aug. OS. being added and divided by the circle 7, will give the ferial for the day of Aug. OS. as found by Rule.

(69). *HC. and HCM. Rule* 8 is the result of Rules 2, 6, 7. And the dates of Moled Tisri being found by progression, the whole can be proved by the result when the GND. of the original GN. is obtained, since the character of the second, as obtained by progression, must be the same as the character of the first with the addition of the character of a cycle. And when finding the day of the month by Rule 6, the hours and scruples must be the same as found by Rule 2. And the ferial found by Rule 7 must be the same as the ferial found by Rule 2. So that the date of Moled Tisri can be proved in different ways. But either of the other quantities may be erroneous, without affecting any other. (57, 63, 72.)

(70). *HC. and HCM. Rule* 9, is obtained from Rule 4. (47–53.)

HC. Examples from AD. 1883 to AD. 1902.

(71). This table has been compared with the more extended table given by Lindo, who says that his calculations have been examined by Airy, the Astronomer Royal, and found to be correct, and that the whole work is approved by distinguished Rabbis in England. There are the following differences, besides that this carries the dates one year further in order to prove the accuracy of the calculations. (157–163.)

(72). In 1887 he gives the year 5648 as 354 instead of 353 days; and in 1897 he gives the Moled Sept. 2 instead of Sept. 26. These are evidently misprints.

(73.) At page 11 he says: "Note. When the hours are more than 12, they are so many past noon as they exceed that number." And in this table he marks them accordingly "M" for Morning and "A" for Afternoon. But all other writers and calculation agree, that 18 hours=noon. And when mean conjunction falls at noon or 18 hours, *Jach* (Rule 3) transfers the date to the next day. And his dates prove that he follows this rule, by giving the same dates as in this table for the 1st Tisri in 1885, 1892, 1896, 1897, 1901. This is simply a mistake as to what 18 hours signifies. (2, 13–14, 132–134.)

(74). He reduces the scruples to minutes and seconds and fractions. These modern measures of time are foreign to this calendar. They would require all the characters to be reduced to minutes and seconds and fractions when working in characters. This is unnecessary labor, since the only use of the fractions of days is to find days.

(75). Columns 9, 10, 11, are here given to exemplify the Rules. They are not given by him, and were unnecessary for his purpose as a simple calendar of dates. And this table is so arranged, that all the quantities in Cols. 7 to 12 are in strict accordance with the standard rules by characters. And from the quantities in Cols. 10 and 12, all the dates of the holidays can be found by Rules 4 and 5 without reference to any other calendar, and without a standard solar year, except that it is the 19th part of 235 lunations=365.246,822 days. But after proving the date of Moled Tisri by the Julian dates in Col. 8 in connection with the Julian date in Col.

6, and then by the rules of HC., finding the Julian date of 1st Tisri in Col. 13, it is more simple to find the familiar dates in Julian time, by means of Rule 9, and the day of January in a tabular form in A. Rules 2–4. In the *Churchman's Year Book* for 1870, William Moore, Esq., gives Lindo's table.

HCM. Example AD. 70.

(**76**). The error of interpretation by HC. Rule 1, is explained in connection with the example, which proves that HCM. Rule 1 is demanded for ancient dates. And this gives an example of determining the embolismic years (22–26), as in the examples AD. 26 to AD. 37 as follows. (77.) And mean full moon fell at Jerusalem at 8 hours 38 min. A.M. on April 14 AD. 70.

Examples of HC. and HCM. from AD. 26 to AD. 37.

(**77**). The first table gives the dates according to the present calendar (HC.). The second table according to the Mosaic rule (HCM.), assuming that the lunar dates by HC. are precisely correct. Hence in both tables the dates of Moled Tisri are the same except that in AD. 26 and in AD. 37, HCM. makes the date of Moled Tisri one lunation later than HC. because HC. gives the full moon of Adar instead of the full moon of Nisan. Thus: The first table shows the date of the Moled=AD. 26.. Aug. 31..19..662. Hence full moon of Nisan March 22..9..620. MD. (A) makes full moon AD. 26 March 22.438,004 and vernal equinox March 23.508,150. Hence the full moon of HC. fell 1.070,146 day *before* the vernal equinox and was the full moon of Adar. Then in AD. 37, the Moled Aug. 29..23..510, gives the full moon of Nisan March 20..13..468. Then MD. gives full moon March 20.598,108, and vernal equinox March 23.172,526. Therefore the full moon of HC. fell 2.574,418 days *before* the vernal equinox and was the full moon of Adar. And AD. 26=GN. 6, and AD. 37=GN. 17. And in the first century AD, GN. 6 and 17 always gave the full moon of Adar, by the rules of HC. The change is produced by removing E from GN. 6 to GN. 5, and from GN. 17 to GN. 16. This makes the Moled fall one lunation later in GN. 6 and 17, as shown in the example of AD. 70. In all the other years, the dates of the Moled are the same. But HC. uses Jach=18 hours, and HCM. makes Jach 10 hours to transfer the date to the next day. And HC. uses A, G, B of HC. Rule 3, while HCM. omits these transfers. Then HC. counts the holidays as beginning in the evening *before* noon of the dates found by rule, while HCM. counts them as beginning in the evening *after* noon of the dates found by rule. And this has an important bearing on the date of the Crucifixion. (14, 17, 22–45, 76, 87, 88, 89, 164–179.)

Date of the Crucifixion.

(**78**). The Evangelists show that Christ had a special passover and instituted the Lord's Supper on Thursday evening, and was crucified about noon of Friday, when the general passover or "high day," "the passover" began on Friday evening in Roman account, but the beginning of the Sabbath in Hebrew account. Matt. xxvi. 17, 18; xxvii. 15, 46, 62; Mark xiv. 1, 12–14; xv. 6, 25, 34, 42; Luke xxii. 1, 7–11; xxiii. 17, 54; John xiii. 1, 2; xviii. 28, 39; xix. 14, 31. Here St. Mark says: "After two days was the passover" (xiv. 1). This in the Roman mode of counting both extremes signifies one day as we count. And the day of crucifixion is called

"*paraskeué*" in the Greek Testament, while the Greeks now call Friday "*paraskeué*." The word signifies *preparation*, ordinarily for the Sabbath, but in this year it was also for the passover (John xix. 14, 31).

(**79**). Six different years are assigned. Jarvis in his Chronological History of the Church (pp. 370–410) makes the date March 25, AD. 28; Clinton, AD. 29; Schaff's Bible Dictionary (p. 181), April 7, AD. 30; Hales, AD. 31; Scaliger, De Emendatione Temporum (p. 562), April 3, AD. 33; Ussher's Chronology (V. 10, pp. 555–562), April 3, AD. 33; Our Reference Bibles with Ussher's Chronology, AD. 33; Jahn's Biblical Archæology (p. 274), AD. 34.

(**80**). In the following table the numbers I. to VII. signify the evenings after noon of Sunday to Saturday upon which the passovers began according to the different rules. "HC."=Hebrew Calendar by the present rules. "Mosaic" rules were still in force at these dates. And Nisan was at times "Postponed" to the next new moon by the Sanhedrim on account of the lateness of the crops. And HC. dates are one day earlier than found by rule, since HC. Rule 1 counts the dates as beginning in the evening *before* noon of the dates found by rule. (See Comparison of HC. and HCM. table.) (10–12, 22–26, 76.) (AC. Note 89.)

PASSOVERS.

Year AD.	HC.	Mosaic.	Postponed.
28	II.	II.	IV.
29	VII.	I.	III.
30	IV.	V.	VII.
31	II.	III.	IV.
32	II.	II.	III.
33	VI.	VI.	I.
34	II.	III.	V.

(**81**). This table shows that AD. 33 is the only year among the above in which the passover began in the evening after noon of Friday. This is the date by the present rules and by the Mosaic rules, which differ in several respects, and two of them bear on the present question. *First.* HC. counts all Hebrew regular dates, one day earlier than the ancient rule which Maimonides believes to have been the Mosaic rule. (Thesaurus Antiquitatum Sacrarum, V. 17, p. 234.) HC. makes the regular date in AD. 33 to be Thursday. *Second.* In AD. 33 both rules make the new moon of Tisri fall Sept. 12, Day vii..23 h.. 533 scruples. Then both add one day because the hours are as much as 18 by HC. and 10 by HCM. This makes the 1st Tisri fall on Day i., where it is left by HCM. But by a rule of HC. which had no existence during the second temple, one day is added to prevent the 1st Tisri falling on Day i., iv., vi. Hence by the accidental counter-action of two departures from the ancient rule in AD. 33, HC. gives the Mosaic date. This is the year assigned by Scaliger and Ussher. And in this year, the Lord's Supper established in the evening after noon of Thursday, could not have been at the regular date of the passover. And such is the conclusion of Scaliger (pp. 567–574), and of Canon Farrar in his "Life of Christ" (V. 2, pp. 474–483). (10–12, 22–26, 34–45, 79.)

(**82**). But during the second temple, when dates were determined by the actual appearance of the new moon of Nisan, one day was added to the date if the moon was not actually seen on the day of its calculated appearance. This would add one day to the ferials in the 3d and 4th columns, and change V. to VI. only in AD. 30, at the first moon, and in AD. 34 at the second moon. It is not probable that two unusual postponements occurred in the same year, so that the question rests between AD. 33 and AD. 30. Then to determine which of these two was the year, St. Mark (xiv. 12) shows that on Thursday sacrifices were made in the temple for the passover in the evening, while (xiv. 1) he says, "After two days was the passover." And St. John (xiii. 1) says of Thursday evening, at the time of the special

passover, "Now before the feast of the passover." And (xix. 31), "for that Sabbath day was a high day," *i. e.*, "The passover," as St. Mark says (xiv. 1), beginning in the evening after noon of Friday. (11.)

(83). Now: Calculation shows no obvious reason for a special passover on the evening after noon of Thursday in AD. 33 when the general passover was on Friday evening, since Friday evening was the Mosaic date of the passover. But it does show that if AD. 30 was the year, then the Mosaic date of the passover was Thursday evening, and that the Sanhedrim must have postponed the date of the "high day," "The passover," to the next evening on account of clouds obscuring the new moon of Nisan on the day of its calculated appearance. This will account for the special passover on Thursday evening, because it was the Mosaic date of the passover. And since the sacrifices could only be killed in the temple, this shows that this was not the only special passover (Mark xiv. 12). Hence all the facts stated by the evangelists concur in AD. 30, and in neither of the other years And hence the conclusion that the crucifixion occurred about noon of Friday, April 7, AD. 30, and that the Lord's Supper was instituted at the Mosaic date of the Passover in the evening after noon of Thursday, April 6, AD 30. And this agrees with the date of the crucifixion in Schaff's Bible Dictionary (p. 181). (79, 164–179.)

2d. *Contra.* Long (1253) says: "If the Jews had made use of the Julian year, and always kept their passover on the 14th of March, or if they had always kept it on the day of the astronomical full moon upon or next after the vernal equinox, as we can ascertain the time of our Lord's crucifixion within four or five years of the truth, we should then only have wanted to find out in which of those four or five years, the 14th March, or the before mentioned full moon was on Friday, and that would have characterized the very year; but that was not the case. The Jewish year in our Saviour's time was irregular, as the beginning of it depended not upon the conjunction of the sun and moon, but upon the first appearance of the moon after conjunction, as settled by the Sanhedrim." Then the note: "de Judœorum anno Christi sœculo, v. Petav. de doctrina temporum. Lib. 2, Cap. 27."

3d. *Now:* The evangelists do not mention the Roman date "the 14th March," (and that was too early for the Passover). But they do show that the Crucifixion occurred on Friday the 14th Nisan. And Maimonides shows that the 14th Nisan was the day of full moon. And Long and others show that the Sanhedrim postponed the date one day when clouds obscured the new moon of Nisan, and to the next new moon when the crops were backward. But these irregularities are included in the above investigation, to prove that the Crucifixion could only have occurred in AD. 30 or 33 at the first moon, or AD. 34 at the second moon; with the stronger reason to suppose that it was in AD. 30, on account of the double Passover. (164–168.)

HCM. Table AD. 1883 to AD. 1902.

(84). The only differences between this table and the HC. Table arise from astronomic causes. In accordance with HCM. Rule 6, the embolismic years are GN. 1, 9, 12, instead of GN. 19, 8, 11 by HC. Rules 2, 6. This makes the dates fall one lunation earlier in 1883, 1891, 1894, 1902, and substitutes the full moon of Nisan for the full moon of Zif. (57–59, 67, 71–75.)

(85). Then, by HCM. Rule 3, *Jach* transfers the date at 10 hours, instead of 18 hours, to prevent the full moon falling later than the end of the 14th Nisan, when

the holiday is counted as beginning in the evening *after* noon of the date found by rule, as required by the Mosaic rule. (23–26, 76.)

(**86**). It so happens, that in this cycle, there is no case of Getrad or Betuthakphat by HCM. Rule 3. In the HC. Table, Getrad occurs in 1886, when the character is iii..15..1060, and the date is transferred at 18 hours by HC. Rule 3. But by HCM. Rule 3, Jach transfers the date at 10 hours, so that JA. in HCM. Table has the same effect as G in the HC. Table. And HCM. Rule 3, retains A, G, B, since each *adds* to the date, and therefore cannot bring the holiday earlier than was possible under the ancient rule. And the ancient rule made the holiday fall *later* than its astronomic date, when the new moon of Nisan was not actually seen, although astronomically visible. (35–37, 41–45, 87–89.)

General Remarks.

(**87**). "The Rev. Dr. Adler, Chief Rabbi of Great Britain," in a sermon copied into the *Jewish Messenger*, says: "Whoever is but slightly acquainted . . . . with the principles upon which the Hebrew calendar has been established, knows that at the time when the members of the great Sanhedrim were sitting at Jerusalem, the ocular observation of the new moon was indispensable, but the results of this were always checked by astronomical computation." (10–12, 144.)

(**88**). Also: "If at the present moment the temple should be restored, and the Sanhedrim re-established, the very same course as of old would be the only one that could be pursued, owing to the circumstance, that the fixing of the calendar depended entirely upon ocular observation of the new moon, and that calculation only was employed with a view to control that observation." (10–12, 144.)

(**89**). Now, in such case the calendar would be nearly the same as HCM., but not precisely. HCM. assumes that the lunar date by HC. is precisely correct for all time. This is not precisely the fact. In AD. 607, HC. gave the lunar date 3 minutes 4 seconds more than MD. And the HC. lunation is 5.4288 seconds per year more than 29.530,589 days per lunation. This makes the lunar date in AD. 33 to be 55 m..35 sec. less than by MD., and in AD. 1883 to be 1 h..54 m. more than by MD. Then in a prearranged calendar, the mean date is used, so as to vary as little as possible from the actual, which varies more than half a day more and less than the mean, and the actual would be used if dates were determined by actual observation. But as Sekles says: "Although at present there is a discrepancy of about 1 h. 43 m. . . . . it answers all practical purposes, and is adopted in all countries on the earth." (13, 14, 18, 87, 88, 154, 155.)

Josephus' Dates.

(**90**). Josephus in his Antiquities, which were published AD. 93, and in his Wars of the Jews, which were published in AD. 75, gives his dates in terms of the Macedonian months, which Scaliger says were identical with the Roman months which he gives in a table, with the approximate Hebrew months. Whiston in his translation, sometimes gives in brackets these approximate Hebrew months as explanatory of the Macedonian months. In such cases the identical Roman month is here added to the approximate Hebrew month in the following. (52, 53, 112.)

(**91**). Ant., Book 2, Chap. 4, Sec. 6: "God . . . . commanded Moses to tell the people . . . . that they should prepare themselves on the tenth day of the month Xanthicus against the 14th (which month is called by the Egyptians Pharmuthi,

and Nisan by the Hebrews; but the Macedonians call it Xanthicus)." (10–12, 52, 53, 93, 104–106, 108–112.)

(**92**). A., B. 3, C. 10, S. 5: "In the month Xanthicus, which is by us called Nisan, and is the beginning of our year, in the 14th day of the lunar month when the sun was in Aries . . . . was called the Passover." (91, 106.)

(**93**). A., B. 11, C. 4, S. 8: "And as the feast of unleavened bread was at hand in the first month, which according to the Macedonians is called Xanthicus, but according to us Nisan. . . . . And they offered the sacrifice which is called *The Passover* in the 14th day of the same month." (91.)

(**94**). Wars of the Jews, with respect to the siege and capture of Jerusalem by Titus in AD. 70. He gives these dates.

(**95**). B. 5, C. 3, S. 1: "On the feast of unleavened bread. . . .it being the 14th day of the month Xanthicus [Nisan"—April]. . . "Eleazar. . . .opened the temple, and admitted such of the people as were desirous to worship God." (91, 93.)

(**96**). B. 5, C. 7, S. 2: "And thus did the Romans get possession of this first wall on the 15th day of the siege, which was the 7th of the month Artemisius [Iyar"—May] (107.)

(**97**). B. 5, C. 13, S. 7: "In the interval between the 14th day of the month Xanthicus [Nisan"—April] "when the Romans pitched their camp about the city, and the first day of the month Panemus [Tamuz"—July]. (104, 105.)

(**98**). B. 6, C. 5, S. 3: "When the people were come in great crowds to the feast of unleavened bread on the 8th day of the month Xanthicus [Nisan"—April]. This was on a former occasion, and Whiston in a note says that it was a week before the Passover, to purify themselves. (91, 93, 95, 108–110.)

(**99**). B. 6, C. 8, S. 4: "And now were the banks finished on the 7th day of the month Gorpiœus [Elul"—September] "in 18 days' time."

(**100**). B. 6, C. 8, S. 5: "And as all was burning came that 8th day of the month Gorpiœus [Elul"—September] "upon Jerusalem." (103.)

(**101**). B. 6, C. 9, S. 3: "The greater part . . .were indeed of the same notion, come up from all the country to the feast of unleavened bread, and were on a sudden shut up by an army." Then to show the number of those who were probably there, he says that on a former occasion: "When the high-priest upon the coming of the feast that is called the Passover, when they slay their sacrifices from the 9th hour till the 11th"—from the number of the sacrifices estimated that there were:—"2,700,200 persons that were pure and holy"—besides a vast number who were not. (10, 104.)

(**102**). B. 6, C. 9, S. 4: "Now this vast number is indeed collected out of remote places, but the entire nation was now shut up as in a prison, and the Roman army encompassed the city when it was crowded with inhabitants." (96, 97.)

(**103**). B. 6, C. 11, S. 1: "And thus was Jerusalem taken in the second year of Vespasian, on the 8th day of Gorpiœus [Elul"—September]. "It had been taken five times before, though this was the second time of its desolation. . . . .And from King David. . . .to this destruction under Titus was 1179 years. . . . .And thus ended the siege of Jerusalem." (100.)

Conclusion from Josephus.

(**104**). The Passover always begins in the evening at the end of the 14th Nisan (Ex. xii. 3–6). That which the Mosaic law requires to be done on the 14th Nisan,

Josephus in four places says was done on the 14th Xanthicus. (Ant., B. 2, C. 4, S. 6; B. 3, C. 10, S. 5; B. 11, C. 4, S. 8. Wars, B. 5, C. 3, S. 1.) And it was on this 14th Xanthicus AD. 70, that Eleazar admitted the people into the temple (Wars, B. 5, C. 3, S. 1), and when "the Romans pitched their camp by the city" (Wars, B. 5, C. 13, S. 7). (10–12, 25, 26, 76, 91–97.)

(**105**). And this 14th Xanthicus was the 14th April, AD. 70, according to Muler, who (Chap. vii.) says that Josephus says that the Passover fell on April 14, *i. e.*, in the evening of April 14. And this is the signification of the 14th Xanthicus according to Scaliger. Therefore in AD. 70, noon of April 14 was noon of the 14th Nisan. (25, 26, 53, 76, 127–130.)

(**106**). Again. Ant., B. 3, C. 10, S. 5:...."in the 14th day of the lunar month when the sun was in Aries....was called the Passover." This agrees with what is stated by others respecting the Mosaic rule. The sun enters Aries at the time of the vernal equinox and remains in Aries a little more than 30 days. So that the Passover always falls on the 14th day of the lunar month in the evening (Ex. xii. 3–6) when the sun is in Aries. (10–17, 92, 115.)

Indefinite dates by Josephus.

(**107**). Wars, B. 5, C. 13, S. 7 and B. 5, C. 7, S. 2. The siege doubtless began on the 14th Xanthicus (April). The 15th day of the siege could not be the 7th Artemisius. This is probably the error of a copyist. The chances are in favor of the accuracy of the date 7th Artemisius. (96, 97, 112.)

(**108**). Again. Antiquities, B. 2, C. 4, S. 6: "God commanded Moses to tell the people....that they should prepare themselves on the tenth day of the month Xanthicus against the 14th (which month is called by the Egyptians Pharmuthi, and Nisan by the Hebrews, but the Macedonians call it Xanthicus)." (10–12, 52, 53, 91, 111, 112.)

(**109**). This is evidently intended to be an explanation of the date of the Hebrew Passover in terms that were used by the Greeks at the time that Josephus was writing. But his explanation requires an explanation thus: Xanthicus is the Greek name of the Roman month April. They were identically the same. In AD. 70 the siege of Jerusalem began on the 14th day of Xanthicus, and the same day was the 14th day of Nisan, that being the date of the full moon of Nisan, or full moon that fell on or next after the vernal equinox which in that year fell on March 22. The 14th Xanthicus was always the 14th April. But the 14th Nisan was the 14th April in AD. 70, only by accident. It fell each year about eleven days earlier until this would bring it earlier than March 22, the date of the vernal equinox, and then 30 days were added to this date. This was the average, so that the 14th Nisan vibrated between March 22 and Xanthicus 19. (10–12, 52, 53, 71–75, 104–105.)

(**110**). Josephus does not intend to say that "God commanded Moses to tell the people . . . that they should prepare themselves on the tenth day of the month Xanthicus for the 14th," as a standing rule. This Greek name for a Roman month was unknown in the time of Moses, and this would have made the 14th Nisan, a purely solar date without regard to the moon. But he does mean that the 14th Nisan should have the same relation to the sun and moon as the 14th Xanthicus in the year of the siege, or 19 years before or after. And that he does not specify.

(**111**). As to Pharmuthi. He does not explain whether he means the Old Style or the New Style of the Egyptian year in the Actian Era (AE.) His Antiquities were published AD. 93=AE. 122; and Censorinus wrote 145 years later in AE. 267. He states among other dates to define that year, that the first day of Thoth fell on June 25th. This shows that Censorinus used the Old Style, and his readers would understand Pharmuthi, as used by Josephus, to begin on Feb. 26, in the year when his Antiquities were published. But the remark of Josephus, implying that Xanthicus and Pharmuthi were the same, shows that he intended his readers to understand that he uses the new style of the Actian Era, since that makes Pharmuthi always begin on March 27, so that the 14th Xanthicus was always the 14th April and the 19th Pharmuthi, but it was the 14th Nisan only once in 19 years, at the least. The old style of the Actian Era (AE.) only changed the number of the year so as to begin with JP. 4685. But it retained the canicular year of the Era of Nabonassar (NE.) with its 5 epagomenai, making the year always 365 days. So that in Julian time the dates receded one day in four years. The new style retain the regular 12 months of 30 days and 5 epagomenai of NE. in common Roman years. But in a Roman Bissextile it had 6 epagomenai, so that the First day of Thoth (New Year) always fell on the Roman Aug. 29. (112, 113, 140–145, 147, 150, 152–156.)

CONTRADICTIONS.

(**112**). *As to Macedonian months.* Whiston in brackets gives the equivalents, Xanthicus [Nisan]; Artemisius [Iyar]; Panemus [Tamuz]; Gorpiœus [Elul]. These are the same as given by Scaliger, but with this difference. Whiston in his appendix gives the Hebrew names and the Macedonian names, and then the two Roman months in which the Hebrew months fall, as if the Hebrew and Macedonian months are the same. On the contrary, Scaliger says that the Macedonian and Roman months are identical, so that the Hebrew names are only approximations. And Muler says that Xanthicus is April. And the Greek use of Roman months under Greek names is analogous to the Egyptian use of their own names in the Actian Era (AE.), when, after their conquest, the year was changed to agree with the Roman year. It would be remarkable if the Greeks changed their year to agree with the Hebrew year. (52–53, 95–103.)

(**113**). *As to Pharmuthi and Xanthicus.* McClintock and Strong (Month) say that—"Josephus synchronizes Nisan with the Egyptian Pharmuthi, which commenced March 27, and with the Macedonian Xanthicus, which answers generally to the early part of April."—Now, Josephus (Ant. B. 2, C. 4, S. 6) does not say that Pharmuthi commenced March 27. The inference is probably correct. Then according to Whiston—"The Macedonian Xanthicus answers generally to the early part of April." But Scaliger says that it is the Macedonian name of the Roman month April. (52, 53, 91, 111, 112.)

(**114**). *As to the double passover in the year of the Crucifixion* Scaliger (pp. 567–574), and Canon Farrar in his Life of Christ (V. 2, pp. 474–483), reach the conclusion that the Lord's Supper was not established at the regular date of the passover. Scaliger (p. 562), and Ussher (V. 10, pp. 555–562), make the date of the crucifixion April 3, AD. 33. Then (p. 555) Ussher says, "But in the first day of unleavened bread, when the passover was sacrificed (on 2d April) the disciples were sent." He then narrates the occurrences and the crucifixion. Then (p. 565), "that the bodies might not remain on the cross on the Sabbath day . . . (for that Sabbath was a

Great day)." This appears to imply that the sacrifices, "on April 2d," were for the passover in the evening of April 3d. But the Evangelists show distinctly that in the year of the crucifixion there was a passover on Thursday evening, while the "great day," "the High day," "the passover," *i. e.*, the general passover, was on Friday evening. For this double passover there was no obvious reason, if the date of the crucifixion was April 3, AD. 33. But there was an obvious reason if the date was Friday, April 7, AD. 30, because the Mosaic date of the passover was in the evening of Thursday, April 6, AD. 30. The ancient rule removes the difficulty. (77–83, 164–179.)

(**115**). *As to the Seasons.* Ideler is quoted by McClintock and Strong (Month) thus: "So much is certain that in the time of Moses, the month of ears [Abib or Nisan] cannot have commenced before the first of April, which was then the period of the vernal equinox." This appears to imply that the equinoxial date of the "Month of Ears" differed in different ages. Now, the exodus occurred JP. 3223, when MD. (A.) makes the vernal equinox fall April 3d. But Nisan never began less than 13 days before to 17 days after the vernal equinox. And this is an artificial date which had no existence. Since that time the precession of the equinoxes, which carries the equinoxial points westward among the stars at the rate of about the semi-diameter of the sun in 19 years, has carried the equinoxial points about one-eighth of a circle westward. But this has no effect upon the seasons, which count from the time that the sun reaches the equinoxial point in the spring. And according to the ancient rule, which Maimonides believes to have been the Mosaic rule, the 1st Nisan began in the evening after the first appearance of the New Moon, which would bring the full moon of Nisan on, or next after the vernal equinox. (106, 142.)

(**116**). *As to the Solar Error of HC.* McClintock and Strong (Calendar) say: "The Jewish months, however, have been placed one lunation later than the rabbinical comparison of them with the modern Julian months, in accordance with the conclusions of J. D. Michaelis, published by the Royal Society of Goettingen. See Month." This appears to imply that the whole series of 19 GN. are a lunation too late. But at the present time (AD. 1639 to AD. 1939) all the GND. give Mosaic dates, except the GND. of GN. 1, 9, 12. (67, 76, 77, 137.)

(**117**). And under "Month" they continue to state the conclusions of Michaelis thus: "That the later Jews fell into this departure from their ancient calendar through some mistake in their intercalation, or because they wished to imitate the Romans, whose year began in March."

(**118**). Now: There is no foundation for either of these suppositions. The present calendar appears to have been constructed on the basis of the solar and lunar dates in AD. 607, and about that time the solar dates corresponded precisely with the ancient rule. But in the first century AD., the GND. of GN. 6, 17, made the passovers fall one lunation too early. At the present time (AD. 1639 to AD. 1939) the GND. of GN. 1, 9, 12, make the passovers fall one lunation too late foı the ancient rule. And all the rest will follow at the rate of one passover in each 342.1 years. (13–17, 30, 64–67, 119, 120, 122, 123, 137.)

(**119**). But "this departure from their ancient calendar" is not, "through some mistake in their intercalation," as an accidental matter. Like all other ancient calendars (AM., JE., NC., OE., OS.), this assumes that 235 lunations are exactly equal to 19 equinoxial years. Like them, it has nothing analogous to NS. Table

II.; AC. Table II.; HCM. Rules 2 and 6, to follow each 235 the moon in its advance from the vernal equinox for 6500 years, until it passes the limit of one lunation after the vernal equinox, and then to substitute a moon one lunation earlier. But, in consequence of the wonderful accuracy of the lunar dates, the true date of each moon will be given very nearly for all time, whether it be the full moon of Adar or of Zif, in place of the full moon of Nisan. (118, 119.)

(**120**). For a similar reason, the Russo-Greeks (AM.) held Easter five weeks too late for the Nicean rule in AD. 1864. And the ecclesiastical date of their full moon of Nisan was five days *after* the date of the full moon of Zif (NB., AM.). (14, 119, 131.)

(**121**). *As to "imitating the Romans, whose year began in March."* There is no apparent connection between the Hebrew and the Roman year, except that by the present rules, the 1st Tisri which falls in September and October, determines all the dates in that Roman year, but in two Hebrew years. And at present the year does not begin with March. And the Roman year is exclusively solar, and as nearly as practicable by whole numbers, the same Roman date represents the same equinoxial date with 12 months in three years of 365 and one of 366 days. On the contrary, the Hebrew year is exclusively lunar, and on the average recedes in equinoxial date 11 days per year until it reaches the limit and then begins a lunation later, to recede again, and consists of 383, 384, 385 days when it has 13 months, and 353, 354, 355 days when it has 12 months. And finally, it is intended to represent, and in AD. 607 it did (on this point) represent the rule established by Moses, before the Romans were in existence. (1, 10–14, 27–29, 40–42, 49, 71–83, 109, 139, 144.)

(**122**). *As to the Solar Error of HC.* Professor Nesselman (Crelle, of 1844, p. 179) says that the Jews are wrong in their rule, since—"In the embolismic years 8, 11, 19, the Passovers will at times fall on the second and not on the first moon." He is answered:—"The object is to put the Passovers, not before the first, nor after the second."

(**123**). Now: The dates of Moled Tisri in GN. 1, 9, 12 determine the dates of the previous Passovers. And by the present calendar, these "fall on the second moon," not only "at times," but always. And by the present interpretation, the Passovers always fall "on" the date of full moon. And that was impossible under the Mosaic rule. Then the answer is partially correct, for the Mosaic rule admitted a postponement to the second moon. But that was only in emergencies while these are always. And at the present time only in the years preceding GN. 1, 9, 12, and not in the remaining sixteen years of the cycle. But in the course of time the present calendar will put all the Passovers, not only "after the second," but after any number of full moons after the second. (10–14, 24, 64–67, 116–121.)

(**124.**) *As to the* 30-*day month of the Deluge.* McClintock and Strong (Month) say: "We have therefore in this instance, an approximation to the solar month." On the contrary, these were Egyptian months, and neither solar nor lunar. (140–144, 151–153, 156.)

(**125**). *As to the date of HC.* Different authors assign the following years as the date of construction of the present calendar, viz.: AD. 325, 345, 352, 353, 360, 369, 424, 500, 525. But internal evidence indicates that it was constructed on the basis of astronomic facts in AD. 607. In that year the lunar date agrees with MDB. with a difference of only 3 minutes 4 seconds. This is slight evidence, since the lunar dates at all times are so nearly correct that they are assumed to be perfect.

But in AD. 607, this calendar makes the date of Moled Tisri Aug. 28..16 hours exactly, and there is only one chance in 1080, that the date should by accident fall at two-thirds of a day without the difference of a single scruple. (1, 15–17, 29, 30.)

(**126**). Then as to the solar date. In the first century the dates of GN. 6 and GN. 17 bring the corresponding Passovers in the month Adar. At the present time the dates of GN. 1, 9, 12 bring the corresponding Passovers in the month Zif. But in AD. 607 this calendar gave Mosaic dates with great precision. The earliest GN. is GN. 17, and AD. 607 being GN. 17, the vernal equinox fell March 19.235,646; and the mean full moon fell March 19.250,558 according to MDB. The minute difference of 0.014,912, may be due to different standards for the date of the moon. But practically the dates are identical. And from AD. 607, the solar date of HC., separates from mean equinoxial date at the rate of 6 minutes 38 seconds per year, or the difference between a mean year of 365.242,216 and the HC. year of 365.246,822 days, or the 19th part of 235 lunations of 29 d..12 h..793 scruples. (11, 16, 17, 28–31, 57–67, 76.)

(**127**). *As to the prime meridian of HC.* Muler (Chap. vii.) calculates substantially thus : " Josephus says that in AD. 70, the Passover fell on April 14. Then add 163 days makes 1st Tisri=Sept. 24, AD. 70=JP. 4783. By rule of Ptolemy full moon fell JP. 4783 April 14..4 h..57..34 from midnight under the meridian of Frisia. Add 8 h..47..10 [for longitude and to count from the previous 6 P.M.] =April 14..13 h..44..44=April 14..13..805 [Hebrew time]=date of full moon at Eden in Babylonia [849 helakim (scruples)=1 h..23 m. east of Jerusalem] counting the hours from sunset. Then by rules of HC. New Moon of Nisan has the character vi..19..409, add half a month 0..18..396=vii..13..805 as before. The character of the New Moon of Nisan is derived from the following New Moon of Tisri which was i..23..847. Take for 6 months ii..4..438 and vi..19..409 remains."

(**128**). Now : This date is indefinite. Muler does not specify whether noon of the 15th Nisan was noon of the 14th April, so that the Passover began in the evening of April 13, according to the present interpretation by HC. Rule 1, or whether the 14th Nisan began in the evening of April 13 and the Passover in the evening of April 14, according to the interpretation of HCM. Rule 1. Josephus shows that HCM. Rule 1 is correct. (22–26, 76.)

(**129**). Also, in the above, Muler by the rules of HC. finds the date of full moon vii..13..805. And "by rule of Ptolemy" he finds the same date April 14..13..805 when Eden is taken as the prime meridian. And there is only one chance in 1080 that two independent rules should give the same date without the difference of a single scruple. Hence the inference that he puts the prime meridian of the present calendar, at "Eden in Babylonia 849 helakim [scruples] east of Jerusalem," because the "rule of Ptolemy" requires that longitude to give the same date as the present calendar.

(**130**). On the contrary, history shows that Jerusalem was the prime meridian during the second temple. And the lunar date in AD. 607 by the present calendar, makes Jerusalem the prime meridian, with the difference of only 3 minutes 4 seconds, from a mean lunation of 29.530,589 days. (10–14, 16, 18, 30, 87, 88.)

(**131**). *As to the Mosaic date of Easter.* Lindo, in his Introduction, says : " The Council of Nice ordered that Easter should not be held on the first day of the

Passover '*ne videantur Judaizare.*' But in 1825 and 1903, both fell on the same day." Here Lindo errs as to the Nicean rule. The day to be avoided "*ne cum Judæis conveniamus,*" as the Missal has it, is not "the first day of the Passover," but the 14th day of Nisan which is the anniversary of the Crucifixion, and Easter must be held on Sunday next thereafter. This date was annually calculated by Egyptian astronomers until the century after the Council of Nicea, when the Alexandrian Canon or Nicean Calendar (NC.) was used as a substitute. This was replaced by the Chalcedonian Calendar (OS., AM.) And that by the Gregorian Calendar (NS.) to which Lindo refers. Now Easter and the first day of the Passover fall on the days of full moon April 3, 1825, and April 12, 1903. But by the Mosaic rule, full moon could not possibly fall later than the 14th Nisan, so that Lindo's calendar is in error, and the Christians held Easter on the Mosaic 14th Nisan, contrary to the Nicean rule. (AC. Notes.) (10–12, 87–88, 120, 125, 126.)

(**132**). *As to the signification of Jach.* Lindo says: "When the hours are more than 12, they are so many past noon." And in his table he marks them accordingly "M" for Morning and "A" for Afternoon. And he says that his calculations have been examined by Airy, the astronomer, and his whole work has been approved by distinguished Rabbis in Great Britain. On the contrary, MD. (A) makes new moon count from 6 P.M. at Jerusalem with a difference of only 3 m. 4 sec. in AD. 607 from the date of Moled Tisri. Hence when Moled Tisri falls at 18 hours, mean conjunction falls at noon. And Maimonides says: "The month begins in the night when new moon appears." And Sekles says: "Noon is 18 hours according to Talmudical computation." And Muler says: "Jewish time counts from 6 hours after noon." And Scaliger says: "Since Jews count from the beginning of the night 18 hours come to noon." But while Lindo mistakes the signification of Jach or 18 hours, and shows that mistake in his table, he uses Jach correctly and transfers the date to the next day, when Moled Tisri reaches 18 hours (or noon) by rule which he then transforms to 6 Afternoon. (2, 13, 14, 71–74, 132–134, 137.)

(**133**). *Also.* Scaliger (p. 126) says: "Since Jews count from the beginning of the night, 18 hours come to noon. Thus when the day appears to have passed, six hours yet remain to the beginning of the night." Now, this is not the fact. The addition of one day for the date of 1st Tisri, when the Moled Tisri falls as late as 18 hours, does not make the "day appear to have passed," but simply shows that mean conjunction falls at noon. Then at the end of that day at 6 P.M., the new moon will be only 6 hours old, and that being too early for Tisri to begin, the date is transferred to the next day. This is obviously the intention of the unknown author of this calendar. But by misinterpretation, the 1st Tisri begins *before* conjunction, as much as the hours and scruples in the date of Moled Tisri, until it reaches 18 hours. And this misinterpretation obscures the signification of *Jach.* (10–14, 22–26, 34–36.)

(**134**). *Also.* Muler (Col. 81) says: "Since 6 P.M. to the following noon are 18 hours, this appears to be a just cause for the transfer." This is substantially an admission that he does not know what Jach signifies, because at the same time he explains in detail the reasons for the other complicated transfers by HC. Rule 3. (26, 34–37, 41, 42, 125, 126, 132, 133.)

(**135**). *As to the perfection of HC.* To the sermon of Rev. Dr. Adler, Chief Rabbi of Great Britain, is appended this note: "This calendar has been so admirably regulated, that it has excited the admiration of some of the most learned as-

tronomers and mathematicians. Scaliger, a distinguished *savant,* writes: . . . 'There is nothing more perfect, nothing more exact than the Jewish calendar.'" (87, 88.)

(**136**). This is true as to the lunar dates, which are said to have been framed by Rab. Ada (or Adda), who was born in Babylon, AD. 188. These can be used for astronomical purposes with the minute correction of less than five and a half seconds (5.3432) per year. And this calendar stands alone in giving dates to the precision of a single scruple of 3⅓ seconds. Consequently it counts every day as one. In this it resembles the Metonic Cycle, and the Mohammedan Cycle. But they count nothing less than whole days, while the Egyptian Cycle, now used by all Christians, counts nothing less than whole days, and makes no difference for the extra day in a leap year, so that it is the least accurate of all cycles, but at the same time the most simple of all cycles. But this excellence of the Hebrew calendar cannot be claimed for the use that is made of these excellent lunar dates. And I am not aware that any one has made a critical astronomical examination of this calendar before the present, to determine how far this claim of perfection can be substantiated. (2, 8, 13–14.)

(**137**). As to HCM. Rule 1, no one refers to the constant error of counting the holidays one day too early. (22–26.) As to HCM. Rule 2, Nesselman does not seem to know, that the solar errors are constant, and are increasing. (122–123.) And Michaelis appears to be in a fog on this point. (116–121.) And no one else has been found who refers to them. As to HCM. Rule 3, Scaliger, Muler, and Lindo do not appear to know what *Jach* signifies, and Lindo, who is certainly in error, says that his calculations have been examined by Airy, the Astronomer Royal, and his work approved by distinguished Rabbis. (132–134.) And no one has undertaken to show the necessity for substituting 10 hours for *Jach* or 18 hours. (35–36.) As to HCM. Rule 6 (64–67), nothing analogous has been found except Table II. of the Gregorian Calendar (NS. Table II.). And that is astronomically false. (AC. Notes). (64–67.)

(**138**). These modifications by HCM. are absolutely required to determine ancient dates, when those dates were determined by actual astronomical observation. The characteristics of the calendar are not changed. If the changes by HCM. Rules 1, 2, 3, 6, were now made, the difference would hardly be observed, except by the mathematician. In like manner, AC. Table II., analogous to the table in HCM. Rule 6, has been substituted for NS. Table II. of the Gregorian Calendar to correct the errors of that table, while retaining the simplicity of that calendar, without the necessity of following the complications of the present Hebrew Calendar. (6–7, 57–70.)

History.

(**139**). The Hebrew mode of dividing the year and counting time, as shown by the present calendar, appears to have been derived from the Babylonian year with which they became familiar during the captivity from BC. 607 to BC. 536, or from JP. 4107 to 4178.

(**140**). It is not the same as Moses used when they left Egypt, since he counts by months of 30 days in his account of the Deluge, which lasted 150 days from the 17th of the 2d Month to the 17th of the 7th Month (Ex. vii. 2, 4, 24). (48, 149.)

(**141**). In the time of Augustus, the Egyptians used as the popular calendar, the "Canicular year," or the "Wandering year," which is called "Thoth" by Newton,

and generally the Era of Nabonassar (NE.). This consisted of 12 consecutive months of 30 days and 5 epagomenai. By order of Augustus a sixth epagomenas was added in the same year as the Roman bissextile (AE.). But still the Egyptians continued to use the 12 consecutive months of 30 days, so that we may infer that this was the popular calendar in the time of Moses. And hence that Moses continued to use months of 30 days, to which the Hebrews had been so long accustomed in Egypt. (111, 113.)

(**142**). This Egyptian year was neither solar nor lunar, but containing invariably 365 days, receded a full Julian year in 1460 Julian years. But in Egyptian time it receded a Canicular year in 1508 years, from the "Year of God," when Thoth 1st (New Year) coincided with the Heliacal rising of Canicula—the Dog star, or its first appearance in the East before sunrise, to its return to the same sidereal period, including the precession of the equinoxes, which carries the equinoxial points Westward among the stars a full circle in about 25,000 years (NE.).

(**143**). The establishment of the passover required a year that should be both lunar and solar, while the Egyptian year was neither, but the best calendar for recording astronomical phenomena, and for recording dates with precision. Hence these Mosaic months of 30 days could not have coincided with Egyptian months, and they were numbered, not named. And among the various Hebrew names, there is not one which resembles the Egyptian names in NE. and AE. (52, 111, 113, 140.)

(**144**). Hence the inference, that the Mosaic mode of determining the beginning of the year, was the same as during the second temple, and such is the opinion of Maimonides. And hence, that beginning the year in the evening after the first appearance of New Moon, which would bring the full moon on the 14th day of the first month on the day of the vernal equinox, or within one lunation thereafter, they counted 30 days for each month, until the new moon of the next year, and put the days between the end of the last full month, and the next new moon in the place of the Egyptian epagomenai of five days. And during the second temple, they did not know at the beginning of the year how many days that year would contain, nor whether it would be a year of 12 months or of 13 months. (10–12, 50, 143.)

(**145**). Newton (V. 5, p. 284) says that "Thoth," of the Egyptians (NE.) was taken to Babylon, JP. 3967. The earliest definite date of an eclipse is given in terms of NE. at Babylon, JP. 3993 (NE., Ex.). This was 114 years before the Captivity. But this was probably used only in recording astronomical phenomena, without making any change in the popular calendar. And such is the opinion of Scaliger (p. 431). It was not well suited for popular use, because neither solar nor lunar, while the present Hebrew calendar and the Olympic calendar (OE.) are the best forms of ancient calendars for popular use, because they depended on the phases of the moon and the position of the sun, which required no calculation, and were both lunar and solar, while the Egyptian year was neither. (27–33, 142.)

(**146**). The Hebrew Calendar (HC.) bears a strong resemblance to the Olympic Calendar (OE.). They were both luni-solar. HC. makes the full moon, on or next after the vernal equinox, the standard for the Passovers. And this is determined by the date of new moon. And OE. makes the new moon on or next after the summer solstice the standard for the Olympian games at full moon on the 15th day of the first month. Both depend upon the date of new moon. Both have

years of 12 and 13 months. And both can be traced back to Babylon. Thus (10–12.)

(**147**). In JP. 4282, Meton determined the date of the summer solstice as the basis of OE., in terms of the Era of Nabonassar (OE.; NE. Ex.). This shows that he was familiar with the Babylonian mode of recording astronomical phenomena. Hence the inference that the popular Greek mode of dividing the year may have come from the same source. And from its similarity to the Hebrew mode, that this may have come from Babylon. (10–12, 50.)

(**148**). Maimonides, Scaliger, and Muler, say that the hour was divided into 1080 scruples, or chelakim, or helakim, by Chaldeans and Arabians as well as by Hebrews, because 1080 is divisible by 2, 3, 4, 5, 6, 8, 9, 10, 12. This peculiarity of the Hebrews, resembles the peculiarity of the Babylonians. (1, 2, 7.)

(**149**). Jahn (p. 112) says: "During the captivity, the Hebrews adopted the Babylonian names of their months. They were Nisan, Zif or Ziv, Sivan, Tammuz, Ab, Elul, Tishri, Bul, Kislev, Tebeth, Shebat, Adar. The first month here mentioned—Nisan—was originally called Abib." Smith (p. 580) says: "Three of these were used before the captivity. Abib in which the Passover fell (Ex. xiii. 4; xxii. 15; xxxv. 18; Deut. xvi. 1) and which was established as the first month in commemoration of the Exodus (Ex. xii. 2). Zif the second month (1 Kings vi. 1, 37); Bul the 8th (1 Kings vi. 38) and Ethanim seventh (1 Kings viii. 2). In the second place we have the names which prevailed subsequently to the Babylonish captivity; of these the following seven appear in the Bible: Nisan the first, in which the Passover was held (Neh. ii. 1; Esth. iii. 7); Sivan the third (Esth. viii. 9); Elul, 6th (Neh. vi. 15); Chislu, 9th (Neh. i. 1; Zech. vii. 1); Tebeth, 10th (Esth. ii. 16); Sebat, 11th (Zech. i. 7); and Adar, 12th (Esth. iii. 7). The names of the remaining five occur in the Talmud and other works. They were Iyar the second (Targum, 2 Chron. xxx. 2), Tammuz the 4th, Ab the 5th, Tisri the 7th, and Marchesvan the 8th. The name of the intercalary month was Veadar, *i. e.*, the *additional* Adar." (48, 52, 53.)

(**150**). Now: We find the peculiarity of counting time by scruples of $3\frac{1}{3}$ seconds also among the Babylonians. And the structure of the Hebrew Calendar closely resembling that of the Olympic Calendar (OE.), with the probability that OE. was derived from the Babylonians. That Moses counted in consecutive months of 30 days, which are only elsewhere known to have been used by Egyptians, while we know from the structure of the Egyptian year, that the Mosaic months of 30 days could not have remained the same as the Egyptian months. Hence, since no Egyptian name is applied to months that are known to be Egyptian in form, the inference is justified, that they were not so called, because the arrangement of the months was not the same, and that the Babylonian names were retained because the arrangement of the months was the same and that the present Hebrew Calendar is of Babylonian origin. (140–150.)

(**151**). *Contra.* Jahn (p. 111) says: "It is evident from the history of the Deluge, an attempt was made to regulate the months by the motion of the sun, and to assign to each of them 30 days; but it was nevertheless observed after 10 or 20 years that there was still a defect of five days." Also, Cruden (Month) and Smith (Month) and McClintock and Strong (Month), call months of 30 days "solar months."

(**152**). Now: We know that the Egyptians used consecutive months of 30 days,

that were neither solar nor lunar, but receded in equinoxial date one day in four years without regard to the sun or moon. And that this "Wandering Year" had five epagomenai at the end of 12 months of 30 days, to complete the year of 365 days. And this was no defect in the year, but it is just the number of days that Jahn says was a "defect," in some kind of a year which he does not specify. And "ten or twenty years" is a large margin to observe a defect of five days. And he does not say whether it was "five days" in each year or in the 10 or 20 years. And he does not inform us who discovered this defect, and when. It could only be about the time of Moses, and it is supposed that no such Mosaic statement can be found. (124, 140, 142, 144, 153.)

(**153**). And it is not obvious what connection a month of 30 days has with the sun. Certainly not the Egyptian month of 30 days, for that paid no regard to sun or moon. The Julian year is a solar year, and the months might be called solar months, although in themselves having no other connection with the sun. But these months are not consecutive months of 30 days, but vary from 28 to 29, 30 and 31 days. The nearest approximation to a solar period of 30 days is the duration of the sun in each of the 12 signs of the Zodiac. But this is not a solar month and is not referred to as such by these authors. And while these five distinguished authors call months of 30 days "solar months," neither of them as far as observed has given the reason. Perhaps it is supposed to be obvious, that since they are not lunar months, they must necessarily be solar months. (140–142.)

(**154**). Also : Seabury (p. 13) says of the Egyptian year (NE.): "That this year was in use among the Chaldeans and Egyptians, from whom Abraham and Moses received it, there seems to be abundant evidence. Though we should admit with Dean Prideaux (in opposition to Kepler and Archbishop Ussher) that the years of the Jews in Canaan were purely lunar, yet they were careful by intercalating the months, to adjust them to the solar standard."

(**155**). Now : There is no room for doubt that Moses was familiar with this Egyptian year, since he had always been accustomed to it, and he uses months of 30 days in describing the duration of the Deluge; and these are only known in the Egyptian calendars, and are purely artificial, since there is nothing in nature to suggest months of 30 days, while the phases of the moon suggest the lunar month alternately 29 and 30 days. But according to Newton, this Egyptian mode of recording astronomic phenomena was not used in Babylon before JP. 3967, and this was 1075 years *after* the death of Abraham in JP. 2892, according to Ussher's Chronology (Gen. xxv. 7). And the institution of the Passover necessarily demanded a "solar standard," and that standard must have been established by Moses. But, who knows that :—"they were careful by intercalating the months," to do it in that particular mode ? On the contrary, this supposes a prearranged calendar like the present. It is more likely, that no artificial calendar determined the dates, and that they were determined by direct astronomic observation, as they were during the second Temple. Such is the opinion of Maimonides, and of Rab. Adler. (12, 87–89, 140–145.)

(**156**). Josephus (Antiquities, B. 1, C. 8, S. 2) says of Abraham, with respect to the Egyptians : "He communicated to them arithmetic, and delivered to them the science of astronomy; for before Abraham came into Egypt they were unacquainted with those parts of learning; for that science came from the Chaldeans into Egypt, and from thence to the Greeks also." This is improbable. But we

know that the Egyptian astronomic year was taken to Babylon in JP. 3967, and that the records there taken, were reported by Ptolemy of Alexandria, through whom we now receive them. (NE.) (145, 155.)

(**157**). *Comparison* of the 14th Nisan by HCM. and HC. with the mean date of full moon counted from 6 hours before midnight at Jerusalem, with lunations of 29.530,589 days. (AC. Notes 89–93.)

(**158**). 1st Col. gives the year AD. in which the full moon represented by the GN. coincides with the mean date of the vernal equinox and becomes the full moon of Nisan, and the moon one lunation later becomes the full moon of Zif.

(**159**). 4th Col. gives the mean date of full moon in Hebrew time, on the basis of a lunation of 29.530,589 days, while the two last columns are on the basis of Hebrew lunations of 29 days 12 hours 793 scruples, or 0.442 of a second more. In AD. 607 the mean date was 3 minutes 4 seconds more than the Hebrew date. In AD. 1883 it was 1 hour.. 53 m..35 seconds, or 0.078,167 of a day less. So that to compare dates, this 0.078,167 must be added to the dates in the 4th Col. (13–17, 30, 31, 71–75, 89, 136-138)

Years AD. of Coincidence.	GN.	Years AD.	Mean date of Full Moon Hebrew Time.	14th Nisan HCM.	14th Nisan HC.
1288	1	1883	24.01	24	52
3683	2	1884	41.90	41	40
6077	3	1885	31.27	31	30
1972	4	1886	50.17	50 A	48 G
4367	5	1887	39.54	39 A	38 A
261	6	1888	27.90	27	26
2656	7	1889	46.80	46 A	45 A
5051	8	1890	36.17	36	34 A
946	9	1891	25.53	25 A	53
3340	10	1892	43.43	43	42
5735	11	1893	32.80	32	31
1630	12	1894	22.17	22	50
4025	13	1895	41.06	41 A	39
6419	14	1896	29.43	29	28
2314	15	1897	48.33	48	47
4709	16	1898	37.70	37 A	36 A
604	17	1899	27.06	27 A	25
2998	18	1900	45.96	46	44
5393	19	1901	35.33	35	34
1288	1	1902	24.69	24 A	52
3683	2	1903	43.59		

(**160**). 5th Col. HCM. dates, and 6th Col. HC. dates are copied from the HCM. and HC. Tables with these modifications. By HCM. Rule 1, the day is counted as beginning in the evening *after* noon of the date found by rule, while by HC. Rule 1, the day is counted as beginning in the evening *before* noon of the date found by rule. Then for the astronomic date, in both cases, take the date one day less than in the table when A adds one day and show that change by marking the date with A in this table. And in 1836 subtract two days and mark the date with G.

(**161**). The 5th Col. shows that when the difference of 0.078,167 between the calculations by mean lunations and by Hebrew lunations is added to the mean dates in the 4th Col., the rules of HCM. invariably make the 14th Nisan fall on the day of full moon.

The 6th Col. shows that by HC. Rule 1, counting the day as beginning in the evening *before* noon of the date found by rule, the 14th Nisan is invariably before the date of full moon.

(**162**). Also that GN. 1, 9, 12, give the dates of the full moons of Zif. And the dates opposite in the first column show when they became the moons of Zif, and the dates when all the other GN. will give the moons of Zif. But GN. 6 and GN. 17 give the moons of Nisan, while for the same years the present Greek Calendar

gives the moons of Zif. Because from internal evidence this calendar is based on astronomic facts in AD. 607, while the Greek Calendar began in AD. 534 with the full moon of Zif of GN. 6, and then received the full moon of Zif of GN. 17 in AD. 604.

(**163**). Also. By Rule 3, HCM. transfers the date when Moled Tisri falls at 10 hours, while HC. transfers the date at 18 hours. This makes the date by HCM. one day later than by HC., when the Moled falls between 10 and 18 hours, as in 1886, 1890, 1891, 1895, 1899, 1900, 1902 in the HC. Table. And the same in the HCM. Table, except 1891 and 1894 when HC. gives the moons of Zif. And this difference of a day for the difference of 10 and 18 hours, added to the difference of a day by interpretation in counting the day as beginning before conjunction, makes the 14th Nisan fall two days before the date of full moon as shown in 1886, 1890, 1895, 1899, and in 1900 when 0.078,167 is added to the mean date.

DATE OF THE CRUCIFIXION.—INSTITUTION OF THE LORD'S SUPPER.

(**164**). *Proposition.* The Crucifixion occurred about noon of Friday, April 7, AD. 30, between two passovers on consecutive evenings, which were both recognized as such by the Sanhedrim. And the Lord's Supper was instituted on Thursday evening, April 6, AD. 30, at the regular Mosaic date of the Passover. (78–83; 173–179.)

(**165**). Different authors assign six different years on and between AD. 28 and AD. 34. But AD. 30 is the only year in which astronomic calculation proves, that every historic statement inside and outside of the Bible agrees with every other historic statement. (79.) Thus:

(**166**). BC. 4 is the latest year that can be assigned to the Nativity, according to Roman history. (Farrar's Life of Christ, Vol. 2, p. 450.) (JE. Note 10.)

(**167**). AD. 27 was the year in which Christ was baptized, according to Ussher's Chronology and our Reference Bibles. This is 30 years after BC. 4. And at this time St. Luke (iii. 23) says: "Jesus himself began to be about thirty years of age."

(**168**). The Crucifixion occurred about three years after the Baptism. (Farrar, Vol. 2, p. 471.) This makes the year of Crucifixion about AD. 30.

(**169**). AD. 30 is the only year among the above in which the Passover could have fallen on Thursday evening as stated by St. Mark (xiv. 12), who says: "And the first day of unleavened bread when they killed the passover, his disciples said unto him, Where wilt thou that we go and prepare that thou mayest eat the passover?" (82.)

(**170**). This shows that the Passover on Thursday evening was recognized by the Sanhedrim. And on this evening the Lord's Supper was instituted. And calculation shows that this was the Mosaic date of the Passover. Thus:

(**171**). The present Hebrew calendar makes Moled Tisri fall AD. 30..Sept. 16.. 8 hours..352 scruples, and consequently the full moon of Nisan AD. 30..at 4 hours, 17 minutes, 13 seconds after noon of Thursday, April 6. The Mosaic rule made the Passover fall in the evening *after* the full moon of Nisan. Hence the Mosaic date of the Passover fell on Thursday evening, April 6, AD. 30, when the Lord's Supper was instituted. (10–14; 20; 77.)

(**172**). Also, AD. 30 is the only year among the above, when the postponement on account of clouds could have brought the "high day" on Friday evening, as stated by St. John (xix. 4), who says: "And it was the preparation for the passover." And (xix. 31), "That the bodies should not remain on the cross on the Sabbath day (for that Sabbath was a high day)." (11.)

CONTRADICTIONS.

(**173**). AD. 33 is the only possible year, according to the present Hebrew calendar, which makes the Passover fall in the evening of Monday in AD. 28; Saturday in AD. 29; Wednesday in AD. 30; Monday in AD. 31; Monday in AD. 32; Friday in AD. 33; and Monday in AD. 34. (81.)

(**174**). AD. 33 is the year given in our Reference Bibles, and in Fordyce's Chronology, and in Rees's Cyclopædia (Chronology). And (by inference) in Clarke's Commentary on Matt. xxvi. 17. (79.)

75). AD. 33 is the year, according to Ussher's Chronology (pp. 555–564), in which he paraphrases the statements made by the Evangelists, but does not undertake to prove that their statements harmonize. (79, 114.)

(**176**). AD. 33 is the year, according to Farrar's Life of Christ (Vol. 2, pp. 575–583), and according to Scaliger, De Emendatione Temporum (pp. 569–574). In these pages they show that the Lord's Supper could not have been instituted at the regular date of the Passover in AD. 33. (81.)

(**177**). AD. 33 is the year, according to a writer in the *Edinburgh Review*, who says: "One of the most urgent critical questions of the day, is that of the collation of the first three Gospels with the fourth. . . . . The first three Gospels speak distinctly of the eating of the Passover by Christ and His disciples before the Crucifixion. . . . . But the fourth Gospel states that the Crucifixion took place before the Passover. . . . . This is where the conflict now halts."

(**178**). Now: This "conflict" arises from the use of the modern astronomic rule to determine ancient dates. The present calendar makes the full moon of Nisan fall in the afternoon of Thursday, April 6, AD. 30 (less than an hour earlier than by present computation). The modern rule makes the Passover begin in the evening *before* full moon. But the Mosaic rule made it fall in the evening *after* full moon. Hence in AD. 30 the present calendar makes the Passover begin in the evening of Wednesday, and that does not agree with any statement in the four Gospels. But the Mosaic rule made the regular date fall on Thursday evening, and that agrees with every historic fact related, both inside and outside of the Gospels.

(**179**). Hence the astronomic conclusion, that in AD. 30 the Sanhedrim recognized the Passover on Thursday evening, April 6, because it was the Mosaic date of the Passover. But in consequence of clouds having obscured the new moon of Nisan, the Sanhedrim had been compelled to postpone the "consecration" of the New Year one day later than its astronomic date. This brought the 15th day of Nisan one day after the true Mosaic date of the Passover. And the general Passover, "The Passover," the "High Day," was on the "15th day of Nisan," as determined by the Sanhedrim. The Mosaic law (Ex. xii. 3–6) made the Passover always begin at the beginning of the 15th day of the first month. (10–14, 22–26, 136, 137, 164, 171.) (AC. Notes 6–11, 75–80.) (Preface.)

JE.*

JE=Julian Era=Julian Calendar, began with the Bissextile JE. 1=BC. 45=JP. 4669=NE. 704=AU. 709, on January 1st.

JE. Rule 1. For JE. into JP.: For the year JP. add 4668 to the year JE. Then in JE. Table find the modern day of the month corresponding with the Roman name, except in JC.0, and then to convert a bissextile into a leap year put the intercalary "Bissextum Kalendas Martii" between Feb. 24 and 25, and add one day to Feb. 25, 26, 27, 28. And to find JC.0, subtract *one* from the year JE. and divide R. by 4, and 2d R. if 0=JC.0. And except as JE. Rule 3.

JE. Rule 2. For JP. into JE. subtract 4668 from the year JP. for the year JE. Then in JE. Table find the Roman name for the day of the month except in JC.0. Then count Feb. 26, 27, 28, 29 one day less and put the intercalary between Feb. 24 and 25. And except as JE. Rule 3.

JE. Rule 3. For JE. Correction. If the year JE. or JP. be found in this table. Then to the date found by JE. Rule 1, add the number of days opposite to the year in the table from Feb. 25 of that year to Feb. 25 of the next year in the table. And from the date found by JE. Rule 2, subtract the number of days.

JE.	JP.	Day.
1	4669	0
4	4672	1
5	4673	0
7	4675	1
9	4677	0
10	4678	1
16	4684	2
17	4685	1
19	4687	2
21	4689	1
22	4690	2
28	4696	3
29	4697	2
31	4699	3
33	4701	2
34	4702	3
37	4705	2
41	4709	1
45	4713	0

JE. Rule 4. For dates in the Proleptic Julian year from Oct. 13 AU. 707 to Dec. 31 AU. 708. Count them the same as by JE. Rules 1 and 2.

JE. Example. The Actian Era (AE.) began NE. 720 Thoth 1st=JP. 4685 Aug. 30. Then (Rule 2) subtract 4668 leaves JE. 17. And (Rule 3) subtract one day, leaves the date JE. 17 Aug. 29 as counted by the Romans. (AE. 1st Ex.) (AC. Notes 24–28, 81, 85; AE. Rule 9.)

* See NS. Preface.

JE. TABLE.

JANUARY.							FEBRUARY.						
Jan.	Month.	Roman Names.	JE. GN.	NC. GN.	Epacts.	Sunday Letters.	Jan.	Month.	Roman Names.	JE. GN.	NC. GN.	Epacts.	Sunday Letters.
1	1	Kal	i	iii	*	A	32	1	Kal	ix		29	D
2	2	iv			29	B	33	2	iv		xi	28	E
3	3	iii	ix	xi	28	C	34	3	iii	xvii	xix	27	F
4	4	Prid			27	D	35	4	Prid	vi	viii	(25) 26	G
5	5	Non	xvii	xix	(25) 26	E	36	5	Non			25, 24	A
6	6	viii	vi	viii	25	F	37	6	viii	xiv	xvi	23	B
7	7	vii			24	G	38	7	vii	iii	v	22	C
8	8	vi	xiv	xvi	23	A	39	8	vi			21	D
9	9	v	iii	v	22	B	40	9	v	xi	xiii	20	E
10	10	iv			21	C	41	10	iv		ii	19	F
11	11	iii	xi	xiii	20	D	42	11	iii	xix		18	G
12	12	Prid		ii	19	E	43	12	Prid	viii	x	17	A
13	13	Idus	xix		18	F	44	13	Idus			16	B
14	14	xix	viii	x	17	G	45	14	xvi	xvi	xviii	15	C
15	15	xviii			16	A	46	15	xv	v	vii	14	D
16	16	xvii	xvi	xviii	15	B	47	16	xiv			13	E
17	17	xvi	v	vii	14	C	48	17	xiii	xiii	xv	12	F
18	18	xv			13	D	49	18	xii	ii	iv	11	G
19	19	xiv	xiii	xv	12	E	50	19	xi			10	A
20	20	xiii	ii	iv	11	F	51	20	x	x	xii	9	B
21	21	xii			10	G	52	21	ix		i	8	C
22	22	xi	x	xii	9	A	53	22	viii	xviii		7	D
23	23	x		i	8	B	54	23	vii	vii	ix	6	E
24	24	ix	xviii		7	C	55	24	vi			5	F
25	25	viii	vii	ix	6	D	56	25	v	xv	xvii	4	G
26	26	vii			5	E	57	26	iv	iv	vi	3	A
27	27	vi	xv	xvii	4	F	58	27	iii			2	B
28	28	v	iv	vi	3	G	59	28	Prid	xii	xiv	1	C
29	29	iv.			2	A							
30	30	iii	xii	xiv	1	B							
31	31	Prid	i	iii	*	C							

MARCH.

Jan.	Month.	Roman Names.	JE. GN.	NC. GN.	Epacts.	Sunday Letters.
60	1	Kal	i	iii	*	D
61	2	vi			29	E
62	3	v	ix	xi	28	F
63	4	iv			27	G
64	5	iii	xvii	xix	26	A
65	6	Prid	vi	viii	(25) 25	B
66	7	Non			24	C
67	8	viii	xiv	xvi	23	D
68	9	vii	iii	v	22	E
69	10	vi			21	F
70	11	v	xi	xiii	20	G
71	12	iv		ii	19	A
72	13	iii	xix		18	B
73	14	Prid	viii	x	17	C
74	15	Idus			16	D
75	16	xvii	xvi	xviii	15	E
76	17	xvi	v	vii	14	F
77	18	xv			13	G
78	19	xiv	xiii	xv	12	A
79	20	xiii	ii	iv	11	B
80	21	xii			10	C
81	22	xi	x	xii	9	D
82	23	x		i	8	E
83	24	ix	xviii		7	F
84	25	viii	vii	ix	6	G
85	26	vii			5	A
86	27	vi	xv	xvii	4	B
87	28	v	iv	vi	3	C
88	29	iv			2	D
89	30	iii	xii	xiv	1	E
90	31	Prid	i	iii	*	F

APRIL.

Jan.	Month.	Roman Names.	JE. GN.	NC. GN.	Epacts.	Sunday Letters.
91	1	Kal	ix		29	G
92	2	iv		xi	28	A
93	3	iii	xvii		27	B
94	4	Prid	vi	xix	(25) 26	C
95	5	Non		viii	25, 24	D
96	6	viii	xiv	xvi	23	E
97	7	vii	iii	v	22	F
98	8	vi			21	G
99	9	v	xi	xiii	20	A
100	10	iv		ii	19	B
101	11	iii	xix		18	C
102	12	Prid	viii	x	17	D
103	13	Idus			16	E
104	14	xviii	xvi	xviii	15	F
105	15	xvii	v	vii	14	G
106	16	xvi			13	A
107	17	xv	xiii	xv	12	B
108	18	xiv	ii	iv	11	C
109	19	xiii			10	D
110	20	xii	x	xii	9	E
111	21	xi		i	8	F
112	22	x	xviii		7	G
113	23	ix	vii	ix	6	A
114	24	viii			5	B
115	25	vii	xv	xvii	4	C
116	26	vi	iv	vi	3	D
117	27	v			2	E
118	28	iv	xii	xiv	1	F
119	29	iii	i	iii	*	G
120	30	Prid			29	A

MAY.

Jan.	Month.	Roman Names.	JE. GN.	NC. GN.	Epacts.	Sunday Letters.
121	1	Kal	ix	xi	28	B
122	2	vi			27	C
123	3	v	xvii	xix	26	D
124	4	iv	vi	viii	(25) 25	E
125	5	iii			24	F
126	6	Prid	xiv	xvi	23	G
127	7	Non	iii	v	22	A
128	8	viii			21	B
129	9	vii	xi	xiii	20	C
130	10	vi		ii	19	D
131	11	v	xix		18	E
132	12	iv	viii	x	17	F
133	13	iii			16	G
134	14	Prid	xvi	xviii	15	A
135	15	Idus	v	vii	14	B
136	16	xvii			13	C
137	17	xvi	xiii	xv	12	D
138	18	xv	ii	iv	11	E
139	19	xiv			10	F
140	20	xiii	x	xii	9	G
141	21	xii		i	8	A
142	22	xi	xviii		7	B
143	23	x	vii	ix	6	C
144	24	ix			5	D
145	25	viii	xv	xvii	4	E
146	26	vii	iv	vi	3	F
147	27	vi			2	G
148	28	v	xii	xiv	1	A
149	29	iv	i	iii	*	B
150	30	iii			29	C
151	31	Prid	ix	xi	28	D

JUNE.

Jan.	Month.	Roman Names.	JE. GN.	NC. GN.	Epacts.	Sunday Letters.
152	1	Kal	xvii		27	E
153	2	iv	vi	xi	(25) 26	F
154	3	iii		viii	25, 24	G
155	4	Prid	xiv	xvi	23	A
156	5	Non	iii	v	22	B
157	6	viii			21	C
158	7	vii	xi	xiii	20	D
159	8	vi		ii	19	E
160	9	v	xix		18	F
161	10	iv	viii	x	17	G
162	11	iii			16	A
163	12	Prid	xvi	xviii	15	B
164	13	Idus	v	vii	14	C
165	14	xviii			13	D
166	15	xvii	xiii	xv	12	E
167	16	xvi	ii	iv	11	F
168	17	xv			10	G
169	18	xiv	x	xii	9	A
170	19	xiii		i	8	B
171	20	xii	xviii		7	C
172	21	xi	vii	ix	6	D
173	22	x			5	E
174	23	ix	xv	xvii	4	F
175	24	viii	iv	vi	3	G
176	25	vii			2	A
177	26	vi	xii	xiv	1	B
178	27	v	i	iii	*	C
179	28	iv			29	D
180	29	iii	ix	xi	28	E
181	30	Prid			27	F

QUINTILIS afterwards JULY.

Jan.	Month.	Roman Names.	JE. GN.	NC. GN.	Epacts.	Sunday Letters.
182	1	Kal	xvii	xix	26	G
183	2	vi	vi	viii	(25) 25	A
184	3	v			24	B
185	4	iv	xiv	xvi	23	C
186	5	iii	iii	v	22	D
187	6	Prid			21	E
188	7	Non	xi	xiii	20	F
189	8	viii		ii	19	G
190	9	vii	xix		18	A
191	10	vi	viii	x	17	B
192	11	v			16	C
193	12	iv	xvi	xviii	15	D
194	13	iii	v	vii	14	E
195	14	Prid			13	F
196	15	Idus	xiii	xv	12	G
197	16	xvii	ii	iv	11	A
198	17	xvi			10	B
199	18	xv	x	xii	9	C
200	19	xiv		i	8	D
201	20	xiii	xviii		7	E
202	21	xii	vii	ix	6	F
203	22	xi			5	G
204	23	x	xv	xvii	4	A
205	24	ix	iv	vi	3	B
206	25	viii			2	C
207	26	vii	xii	xiv	1	D
208	27	vi	i	iii	*	E
209	28	v			29	F
210	29	iv	ix	xi	28	G
211	30	iii		xix	27	A
212	31	Prid	xvii		(25) 26	B

SEXTILIS afterwards AUGUST.

Jan.	Month.	Roman Names.	JE. GN.	NC. GN.	Epacts.	Sunday Letters.
213	1	Kal	vi	viii	25, 24	C
214	2	iv	xiv	xvi	23	D
215	3	iii	iii	v	22	E
216	4	Prid			21	F
217	5	Non	xi	xiii	20	G
218	6	viii		ii	19	A
219	7	vii	xix		18	B
220	8	vi	viii	x	17	C
221	9	v			16	D
222	10	iv	xvi	xviii	15	E
223	11	iii	v	vii	14	F
224	12	Prid			13	G
225	13	Idus	xiii	xv	12	A
226	14	xix	ii	iv	11	B
227	15	xviii			10	C
228	16	xvii	x	xii	9	D
229	17	xvi		i	8	E
230	18	xv	xviii		7	F
231	19	xiv	vii	ix	6	G
232	20	xiii			5	A
233	21	xii	xv	xvii	4	B
234	22	xi	iv	vi	3	C
235	23	x			2	D
236	24	ix	xii	xiv	1	E
237	25	viii	i	iii	*	F
238	26	vii			29	G
239	27	vi	ix	xi	28	A
240	28	v		xix	27	B
241	29	iv	xvii		26	C
242	30	iii	vi	viii	(25) 25	D
243	31	Prid			24	E

SEPTEMBER.

Jan.	Month.	Roman Names.	JE. GN.	NC. GN.	Epacts.	Sunday Letters.
244	1	Kal	xiv	xvi	23	F
245	2	iv	iii	v	22	G
246	3	iii			21	A
247	4	Prid	xi	xiii	20	B
248	5	Non		ii	19	C
249	6	viii	xix		18	D
250	7	vii	viii	x	17	E
251	8	vi			16	F
252	9	v	xvi	xviii	15	G
253	10	iv	v	vii	14	A
254	11	iii			13	B
255	12	Prid	xiii	xv	12	C
256	13	Idus	ii	iv	11	D
257	14	xviii			10	E
258	15	xvii	x	xii	9	F
259	16	xvi		i	8	G
260	17	xv	xviii		7	A
261	18	xiv	vii	ix	6	B
262	19	xiii			5	C
263	20	xii	xv	xvii	4	D
264	21	xi	iv	vi	3	E
265	22	x			2	F
266	23	ix	xii	xiv	1	G
267	24	viii	i	iii	*	A
268	25	vii			29	B
269	26	vi	ix	xi	28	C
270	27	v		xix	27	D
271	28	iv	xvii		(25) 26	E
272	29	iii	vi	viii	25, 24	F
273	30	Prid	xiv		23	G

OCTOBER.

Jan.	Month.	Roman Names.	JE. GN.	NC. GN.	Epacts.	Sunday Letters.
274	1	Kal	iii	xvi	22	A
275	2	vi		v	21	B
276	3	v	xi	xiii	20	C
277	4	iv		ii	19	D
278	5	iii	xix		18	E
279	6	Prid	viii	x	17	F
280	7	Non			16	G
281	8	viii	xvi	xviii	15	A
282	9	vii	v	vii	14	B
283	10	vi			13	C
284	11	v	xiii	xv	12	D
285	12	iv	ii	iv	11	E
286	13	iii			10	F
287	14	Prid	x	xii	9	G
288	15	Idus		i	8	A
289	16	xvii	xviii		7	B
290	17	xvi	vii	ix	6	C
291	18	xv			5	D
292	19	xiv	xv	xvii	4	E
293	20	xiii	iv	vi	3	F
294	21	xii			2	G
295	22	xi	xii	xiv	1	A
296	23	x	i	iii	*	B
297	24	ix			29	C
298	25	viii	ix	xi	28	D
299	26	vii		xix	27	E
300	27	vi	xvii		26	F
301	28	v	vi	viii	(25) 25	G
302	29	iv			24	A
303	30	iii	xiv	xvi	23	B
304	31	Prid	iii	v	22	C

JE.

NOVEMBER.							DECEMBER.						
Jan.	Month.	Roman Names.	JE. GN.	NC. GN.	Epacts.	Sunday Letters.	Jan.	Month.	Roman Names.	JE. GN.	NC. GN.	Epacts.	Sunday Letters.
305	1	Kal			21	D	335	1	Kal	xi	xiii	20	F
306	2	iv	xi	xiii	20	E	336	2	iv		ii	19	G
307	3	iii		ii	19	F	337	3	iii	xix		18	A
308	4	Prid	xix		18	G	338	4	Prid	viii	x	17	B
309	5	Non	viii	x	17	A	339	5	Non			16	C
310	6	viii			16	B	340	6	viii	xvi	xviii	15	D
311	7	vii	xvi	xviii	15	C	341	7	vii	v	vii	14	E
312	8	vi	v	vii	14	D	342	8	vi			13	F
313	9	v			13	E	343	9	v	xiii	xv	12	G
314	10	iv	xiii	xv	12	F	344	10	iv	ii	iv	11	A
315	11	iii	ii	iv	11	G	345	11	iii			10	B
316	12	Prid			10	A	346	12	Prid	x	xii	9	C
317	13	Idus	x	xii	9	B	347	13	Idus		i	8	D
318	14	xviii		i	8	C	348	14	xix	xviii		7	E
319	15	xvii	xviii		7	D	349	15	xviii	vii	ix	6	F
320	16	xvi	vii	ix	6	E	350	16	xvii			5	G
321	17	xv			5	F	351	17	xvi	xv	xvii	4	A
322	18	xiv	xv	xvii	4	G	352	18	xv	iv	vi	3	B
323	19	xiii	iv	vi	3	A	353	19	xiv			2	C
324	20	xii			2	B	354	20	xiii	xii	xiv	1	D
325	21	xi	xii	xiv	1	C	355	21	xii	i	iii	*	E
326	22	x	i	iii	*	D	356	22	xi			29	F
327	23	ix			29	E	357	23	x	ix	xi	28	G
328	24	viii	ix	xi	28	F	358	24	ix		xix	27	A
329	25	vii		xix	27	G	359	25	viii	xvii		26	B
330	26	vi	xvii		(25) 26	A	360	26	vii	vi	viii	(25) 25	C
331	27	v	vi	viii	25, 24	B	361	27	vi			24	D
332	28	iv			23	C	362	28	v	xiv	xvi	23	E
333	29	iii	xiv	xvi	22	D	363	29	iv	iii	v	22	F
334	30	Prid	iii	v	21	E	364	30	iii			21	G
							365	31	Prid	xi	xiii	(19) 20	A

JE. NOTES.

JE.=JULIAN ERA=JULIAN CALENDAR.

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1. *As to JE. Rules* 1 *to* 3. JE. 1=BC. 45 was a bissextile. Calculation assumes that JE. 1 and each 4th year before and after JE. 1 was a bissextile or a leap year. But through error, the Romans counted JE. 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34 as bissextiles, and corrected this error of 3 days, by omitting the regular intercalaries in JE. 37, 41, and 45. So that after Feb. 24 in JE. 45 or BC. 1, the dates became regular. Rule 3 changes the irregular Roman dates into regular dates of calculation and the reverse. This is shown in JE. Example, and more fully in AE. Note 9.

2. *As to JE. Rule* 4. The last "year of confusion" was calculated backwards from Oct. 13 to Dec. 31 and contained 445 days, and was called the Proleptic Julian year. For an extended account of the Roman year, see Jarvis' Chronological History of the Church, pp. 55–97. (AC. Notes 99–101.)

3. *As to JE. Table.* The first Col. gives the day of January or day of the year in a common year of 365 days, as in Appendix (Jan. Min.). The 2d and 3d Col. the day of the month in the modern and in the Roman form. And the Roman intercalary Bis-sextum Kalendas Martii, was between Feb. 24 and 25, or the "second sixth before March 1st" in the Roman mode of counting both extremes. Then JE. GN=JE. Golden Numbers, are put opposite to the dates of new moon, counting JE. 1 or BC. 45 as GN. 1. Thus, history says that JE. began on Jan. 1, BC. 45, on the day of new moon. And MD. makes new moon fall 7 h. 23 m. after noon at Rome in BC. 45. This is an Egyptian form of the cycle of 235 new moons in 19 years, which was adapted to Roman dates by Sosigenes, the Egyptian astronomer, who framed the Julian Calendar. Then NC. GN. are the Nicean Calendar GN. or the GN. of the Alexandrian cycle, which was the first Christian calendar, and was adopted in the century after the Council of Nicea in AD. 325, to determine the dates of Easter. This puts GN. 3 at March 31, and MD. makes new moon fall at Jerusalem 1 hour 42 minutes A.M. of March 31, AD. 325. Consequently NC. GN. 3=AD. 325. And from that day to the present the Westerns have always counted AD. 325=GN. 3. But JE. GN. 9=AD. 325 which is put at April 1, or one day later. Because in Julian time the date of the moon recedes 0.3241 day per century, and from BC. 45 to AD. 325 it had receded 1.19 day. (AC. Notes 101.)

4. Jarvis (pp. 87-92) gives both of these Egyptian cycles, with remarks which

are criticised (AC. Notes 94–101). The characteristics of the Egyptian cycle are given in AC. Rules and Notes.

5. The Roman Epacts were introduced in AD. 1582 and are copied from the Roman Missal, where they are given without the corresponding GN. But when in this table they are collated with these two Egyptian cycles, it appears that the standard Epact * is at the same date as JE. GN. 1 and NC. GN. 3 throughout the entire cycle. They are substantially dates of GN. in the reverse order. And they divide the year into lunar months of 30 and 29 days, as the Sunday letters divide the year into weeks of 7 days. So that the Epact for the year determines the Epact of the GN. instead of its date, as the dominical determines which day is Sunday. And the explanation in the Missal shows how the Epacts are obtained from the GN. *Contra* (AC. Notes 120–130).

6. The Sunday letters A to G, are derived from the Roman Nundinal letters A to H in the Julian Calendar.

History.

(**7**). Anthon (Calendars) says that the introduction of JE. was postponed to the date of new moon, so that the lunar cycle might begin on the first day of the year, and that modern computation makes new moon fall JP. 4669, Jan. 1, at 6 h. 6 m. P.M. The JE. table shows GN. 1, at Jan. 1, and MD. makes the *mean* date of new moon JP. 4669, Jan. 1, at 7 h. 23 m. P.M. (3.)

(**8**). Brady (p. 27) says that originally February had 29 days in a common year, and Sextilis had 30 days. But when Augustus changed the name of Sextilis to August, he took one day from February and added it to August. Also (p. 26), on the restoration of Charles II., the revivers of the Liturgy changed the intercalary to Feb. 29.

(**9**). AE. Note 9, shows that after the confusion of dates arising from putting the intercalaries in the wrong years, the first regular date was Feb. 25, BC. 1. And BC. 1 is the basic year of the Western lunar cycle, to find the "Prime" or Golden Number. And this is the same as the original Egyptian cycle which was adopted in the fifth century AD., as the first Christian calendar. (AC. Notes 81–84.)

(**10**). Also, the first perfect year after this confusion of dates, was AD. 1. This may have been intentional on the part of Dionysius when he proposed this year as the standard of the Dionysian Period. (HC. Notes 166–170.)

(**11**). For the long and short months: Take the 4 fingers and 3 spaces. Then count Jan. = 1st finger, Feb. = 1st space, etc., to July = 4th finger, Aug. = 1st finger, etc., to Dec. = 3d finger. Then the fingers represent the long months, and the spaces the short months. Was this intentional?

(**12**). *Contra.* Adams (p. 355) says: "Cæsar was led to this method of regulating the year, by observing the manner of computing time among the Egyptians, who divided the year into 12 months, each consisting of 30 days, and added 5 intercalary days at the end of the year, and every fourth year, 6 days. *Herodot.* ii. 4. These supernumerary days Cæsar disposed of among those months which now consist of 31 days, and also the two days which he took from February; having adjusted the year so exactly to the course of the sun, says Dio, that the insertion of one intercalary day in 1461 years, would make up the difference (Dio, xliii. 26), which, however, was found to be ten days less than the truth. Another difference between the Egyptian and Julian year was, that the former began in September, and the latter in January.

(**13**). *Now:* Sosigenes, the author of the Julian Calendar, was an Egyptian astronomer. There can be no doubt that JE. with three years of 365 days, and a fourth with 366 days, was founded on the Egyptian year. But the table, AE. Note 9, shows:

(**14**). *First.* JE. was established JP. 4669, and AE. was established JP. 4685. And until JP. 4685, the Egyptian year (NE.) had invariably 365 days, and hence in Julian time receded one day in each four years, and a full year in 1461 Egyptian years, or 1460 Julian years.

(**15**). *Second.* In JP. 4685 the Egyptians were compelled by the conquering Romans to add the sixth intercalary in the same year as the Roman bissextile, so that instead of having a different Roman date every 4 years, the Egyptian year should always begin on August 29 in Roman time, and not in "September." (AE.)

(**16**). *Third.* 1461 years required a full year, and not "one intercalary day," to "make up the difference" between the old Egyptian year and the Roman year. And in AD. 1582, the difference "was found to be ten days," that the Julian year was too long, and NS. eliminated these ten days by counting October 5, OS. = October 15, NS., and thereafter excluding 3 intercalaries in 4 centuries. (AC. Notes 31–35; AE. Notes; NS. Notes; AU.)

(**17**). *Authors:* Adams' Roman Antiquities (pp. 352–358); Brady's Clavis Calandria; Jarvis' Chronological History of the Church (pp. 44–96); Long's Astronomy (Sec. 1241–1248); Anthon's Classical Dictionary (Calendars); Rees' Cyclopædia (Calendar).

ME.

ME.=MOHAMMEDAN ERA=TURKISH CALENDAR.

These rules count from Thursday, July 15, AD. 622, in civil time from sunset *after* noon, and one day less than the same actual date, Friday, July 16, AD. 622, in Mohammedan time, from sunset *before* noon.

ME. Rule 1. Mohammedan Cycle of 30 years.

	GN.	GND.		GN.	GND.		GN.	GND.		GN.	GND.
	1	0		9	2835		17	5670		25	8505
K	2	354	K	10	3189	K	18	6024	K	26	8859
	3	709		11	3544		19	6379		27	9214
	4	1063		12	3898		20	6733		28	9568
K	5	1417	K	13	4252	K	21	7087	K	29	9922
	6	1772		14	4607		22	7442		30	10,277
K	7	2126		15	4961		23	7796		1	10,631
	8	2481	K	16	5315	K	24	8150			

ME. Rule 2. Distances of first days of the months from the beginning of the year.

	No.	Dist.
Moharrem (Muharrem, Mohurrum)...........	1	0
Safar (Safer, Saafar)...........	2	30
Rabi-el-awwel (el-aouel, el-ewwel, prior)...........	3	59
Rabi-el-accher (el-akhir, el-thany, posterior)...........	4	89
Dschemadi el-awwel (Djemasi, Djoumadi)...........	5	118
Dschemadi-el-accher (Djemasi, Djoumadi)...........	6	148
Redscheb (Redjeb, Rajeb)...........	7	177
Shaban (Saban, Chaban)...........	8	207
Ramadan or Ramasan...........	9	236
Schewwal (Schaouel, Sawal)...........	10	266
Dsu 'l-kade (Zaulkadeh, Dulhajee)...........	11	295
Dsu-'l-hedsche (Zaulhedghe, 'lhijah)...........	12	325

And the 12th month has 29 days in a common year, but 30 days in a year marked K (Kebices) in ME. Rule 1.

ME. Rule 3. For ME. into AD. Divide the year ME. by the circle 30 for Q of past cycles+R=GN. Then multiply Q by 10,631, and to P add the number which in Rule 1 is opposite to GN., and the number which in Rule 2 is opposite to the name of the given month and the given day of the given month and the constant 227,015 and S=DAD.=Days AD.

Then divide DAD. by 1461 for 1st Q and 1st R. Divide 1st R by 365 for 2d Q and 2d R. Then multiply 1st Q by 4 and to P, add 2d Q and the constant 1, and S=year AD. Then 2d R=day of Jan. OS., to which add NS. SC. for Jan. NS.

ME. Rule 4. For AD. into ME. From Jan. NS. subtract NS. SC. for Jan. OS. Then subtract *one* from the year AD. and divide 1st R by 4 for Q and 2d R. Multiply Q by 1461 and 2d R by 365. To these products add the day of Jan. OS. and S=DAD. From DAD. subtract the constant 227,015. Divide R by 10,631 for Q and 2d R. From 2d R subtract the number which in Rule 1 is next less for 3d R, and reserve the GN. opposite. Then from 3d R subtract the number which in Rule 2 is next less, and 4th R=day of the month opposite to the last number subtracted. Then multiply Q by 30 and to P add GN. and S=Year ME.

ME. Rule 5. For Ferial. Subtract *one* from DAD., and divide R by the circle 7 and 2d R, 1 to 7=Sunday to Saturday.

1=	Youm-el-ahad.	
2=	"	" thany.
3=	"	" thaleth.
4=	"	" arbaa.
5=	"	" klanis.
6=	"	" djoum.
7=	"	" sabt.

ME. Rule 6. Special dates. 1st Muharrem=Aïd-el-riachab=New Year=a feast. The 10th Muharrem=Ashoura is a very rigorous fast. The 12th Rabi-el-aouel=Mevloud=day of birth and death of Mohammed. The 12th Djemasi-el-aouel is the anniversary of the capture of Constantinople. The 29th Redjeb=ascension of Mohammed on the ass Borak or Bulak. The 15th Chaban=anniversary of the total descent of the Koran. Ramadan for the whole month, fast during the day and banquets at night. The 27th Ramadan=Lailat-el-kadr=night of power=beginning of the descent of the Koran. 1st, 2d, 3d Chaoul=Bairam Kutchuck=feast of the Little Bairam=Aïd-el-saghir=Aïd-el-fatah, when they express great joy for the end of the fast, and make extraordinary prayers in the mosks. The 10th Zoulhedghe=Beiram Buyouk=Grand Beiram=Aïd-el-habir=Aïd-el-corban=Aïd-el-adhha=Mohammedan passover, when victims are slain.

Monday is for marriages. Wednesday is a holy day as Sunday with us, or as Saturday with the Jews. The 13th, 14th, 15th days of the month are fortunate.

ME. Examples.

ME. 1st Ex. Ideler (p. 466) gives ME. 367 Schewwal 29. Then 367÷30=Q 12+GN. 7=GND. 2126. Then 12×10,631+GND. 2126+Schewwal dist. 266+day 29+constant 227,015=DAD. 357,008;÷1461=Q 244+R 524;÷365=2d Q 1+Jan. 159 OS.=June 8. Then Q 244×4+2d Q 1+constant 1=AD. 978..June 8.

ME. 2d Ex., with constant 227,015, dated OS.

Standard ....ME. 1, M 1, D 1=AD. 622 July 15.
Ideler (p. 466)........................ME. 367..M 10..D 29=AD. 978 June 8.
Journal Asiatique (p.   ).............ME. 1228..M 1..D 1=AD. 1812 Dec. 22.

Phil. Trans.............................ME. 1228..M 1..D 1=AD. 1812 Dec. 22.
" " ....ME. 1251..M 1..D 1=AD. 1835 April 16.

ME. 3d Ex., with constant 227,016, dated OS.

Conn. des Temps.........................ME. 1251..M 1..D 1=AD. 1835 April 17.
Conn. des Temps.................. ....ME. 1201..M 1..D 1=AD. 1786 Oct. 13.
Greenwich Naut. Al....... .... .ME. 1273..M 1..D 1=AD. 1856 Aug. 21.
American Naut. Al ....ME. 1273..M 1..D 1=AD. 1856 Aug. 21.

ME. 4th Ex. Rule 4, with constant 227,015 dated OS. Greaves' tables AD. 1783 Nov. 14 OS. Jan. 318=M 1..D 1. Then 1783−1 ;÷4=Q 445+R 2. Then 445×1461+2×365+Jan. 318=DAD. 651,193 ;−227,015 ;÷10631=Q 39+R 9539. Subtract 9568 GND. of GN. 28, leaves Day 1 ; subtract the next less in table 2, leaves M 1..D 1. Then Q 39×30+GN. 28=Year ME. 1198..M 1..D 1.

Also, AD. 1784 Nov. 2 OS.=ME. 1199 M 1..D 1.

ME. 5th Ex. Rule 4 with constant 227,016, dated OS. This makes the dates of the 1st Muharrem fall one day later than in the 4th Ex., and this will agree with almanacs printed in Calcutta, according to the usage of the Mahometans of India. So says Marsden, Phil. Trans. AD. 1788, Vol. 78, p. 424. (4, 6, 7, 25.)

ME. NOTES.

ME.=MOHAMMEDAN ERA=TURKISH CALENDAR.

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(1). These rules count from Thursday, July 15, AD. 622, in civil time from sunset *after* noon, and one day less than the same actual date Friday, July 16, AD. 622, in Mohammedan time counted from sunset *before* noon.

(2). This is an important difference, and when giving rules or dates, precision requires the statement whether it is civil time or Mohammedan time. Thus: MD. makes mean new moon at Mecca fall AD. 622, July 14..1 h..26 m., A.M. Ideler (p. 485), in a note, says that mean conjunction at Mecca fell AD. 622, July 14..1 h..12 m., A.M., thus differing only 14 minutes from MD. But he says that according to Delambre's tables, the true date of conjunction at Mecca was July 14.. 8 h..17 m., A.M., and on the 15th July the moon became visible before evening. This is high authority, since Ideler was the Astronomer Royal at Berlin. Then (p. 459), he says: "Niebuhr says 'the day on which the new moon first appears is the first day of the month. When the heavens at the time of new moon are covered with clouds, the month begins a day earlier or later.'. . . . The astronomers of the Sultan at Constantinople make each year a new almanac, which they constantly carry with them. By the Arabians I have seen nothing like this."

(3). Marsden says: "The Arabians and Syrian-Christians and Mahometan astronomers generally appear to have fixed the day to Thursday," but in later times it has been fixed to Friday. The moon became visible at Mecca on the evening of Thursday, "which was to them the commencement of Friday (beginning a few hours later), which we term the 15th July." Pierce (Vol. 8, p. 153) says that the Hedschra was "on the 15th (not 16th) July, AD. 622." But (p. 721) he says that in making this reduction, the difference between the time at which the day begins in the Turkish and Christian calendars must be taken into consideration . . . . as it may make a difference of one day more or less. Francœur (p. 111) says that the Mahometans determine the date by observation. The rule gives the mean date for the learned, and at times varies two or three days. But they generally give the day of the week, and that removes all doubt. "According to M. Ideler, conjunction fell 14 July, 6 h..22 m., mean time [? 2]. Therefore the crescent was visible 15th July in the evening, and the month Muharrem fixed by this appearance must commence 16 July."

(4). This last remark shows that ME. 3d Ex., from Con. des Temps, must be understood to be in Mohammedan time on the basis of July 16, as also the examples ME. 3d Ex. from the English and American Nautical Almanacs, which only give the dates, and ME. 5th Ex. from the Almanac in Calcutta, and the Oxford Chronological Tables, which give the date of the Hegira, July 16, 622. Also Weber says that Mohammed was compelled to fly from Mecca to Modina 16th July, 622. "The Mohammedans reckon their years from this event, which is called the Hegira." But the rules give one day less than these Mohammedan dates, because in civil time on the basis of July 15, in accordance with the rule given by Ideler and ME.

1st Ex. from Ideler, and ME. 2d Ex. from Ideler, and the Journal Asiatique and the Phil. Trans., and ME. 4th Ex. by Greaves.

(**5**). *Contra.* Clemens Petersen, in Johnson's Cyclopedia (Mohammed) says: "The famous Hedjrah or flight from Mecca to Modina (250 miles) occurred Sept. 20, 622, from which date the Mohammedan era begins."

(**6**). *Contra 2d.* Marsden (p. 424) says: "Note.—According to the original table by Greaves the first day of Moharram in 1783 falls 14 Nov., OS., or 25 Nov., NS., and in 1784 on 2d Nov., OS., or 13 Nov., NS., whereas by two almanacs printed at Calcutta in Bengal, it appears that the days should be the 26th and 14th Nov.... both founded on the usage of the Mahometans of India." This shows that Marsden thinks Greaves in error, and that he does not recognize the difference of a day as arising from a different mode of counting time, as shown in the examples, where the 2d and 4th use the same constant 227,015, and the dates by these almanacs require the constant 227,016.

(**7**). *Contra 3d.* The adjoining comparison of ME. Examples has first the year ME., then the date OS. in AD. for ME. 1, M. 1, D. 1, in civil time on the basis of the beginning of ME. in AD. 622, July 15, at sunset, by ME. Rule 3. Then the date OS. of the same years ME., from Marsden's table of dates from AD. 622 to AD. 2000, copied into Rees (Hegira) with the remark that "Mr. Marsden.... has given a very valuable table .... in which he has improved upon those in Greaves," etc. But these few dates, which accidentally occurred in ME. examples, show that his dates are not reliable, because not uniform. He counts in Mohammedan time on the basis of July 16 in ME. 1, 1201, 1198, 1199, like the three nautical almanacs in ME. 3d Ex., and like the almanacs in Calcutta in the 5th Example. Then in civil time on the basis of July 15 in ME. 1288, 1251, like ME. Rule 3, and Ideler, and Journal Asiatique, in ME. 2d Ex., and even like Greaves (whom he condemns as to these same dates) in ME. 4th Ex. Then in ME. 1273, on the basis of July 14, like no one else. The reader has the rules before him, and can criticise this criticism.

ME.	AD. by Rule 3.		Marsd.
1	622	July 15	July 16
1228	1812	Dec. 22	Dec. 22
1251	1835	April 16	April 16
1201	1786	Oct. 12	Oct. 13
1273	1856	Aug. 20	Aug. 19
1198	1783	Nov. 14	Nov. 15
1199	1784	Nov. 2	Nov. 3

(**8**). *ME. Rule* 1. To construct the Cycle. Ideler quotes the rule from the Arabic of Abu 'lhassan Kuschjar, and says substantially, that 12 months alternately 30 and 29 days=354 days. But 12 mean lunations are counted 8 h..48 min. in excess. Add this excess per year and when the hours exceed 12, make the last month 30 days. This makes the embolismic years=2, 5, 7, 10, 13, 16, 18, 21, 24, 26, 29, as in the table. Then:

(**9**). Begin with zero, at GN. 1, and for the distance of the beginning of GN. 2 after the beginning of the cycle add 354 days for a common year. Then to GND. of the embolismic year GN. 2 add 355 days. And thus continue to add 354 days to the GND. of a common year and 355 days to the GND. of an embolismic year, making 10,631 days in the cycle of 360 months in 30 years.

(**10**). If the months were uniformly 30 and 29 days, the cycle would contain 10,620 days. But the 11 embolismic days additional make it 10,631 days. And 360 mean lunations of 29.530,589 days=10,631.012,040 days. So that this calendar makes the Turkish crescent grow less at the rate of one day in 2491 years.

(**11**). *Contra* 1*st*. Ideler puts 354 opposite to year 1, and all the other numbers one year earlier than in ME. Rule 1. But the embolismic years and the numbers are the same. This arrangement is used as an improvement upon Ideler's arrangement.

(**12**). *Contra* 2*d*. Francœur, and the Journal Asiatique, use Ideler's table, except that in place of making GN. 16 the embolismic year, they substitute GN. 15. This is astronomically more accurate than Ideler's table. This was doubtless known by Ideler, since by the Arabic authority which he quotes, he states the excess at 8 h.. 48 m., which makes GN. 16 the embolismic year, while at the same time (p. 479) he gives the actual excess 8 h...48 m...36 s.=0.367,083, and this in GN. 15 makes the excess 5.506, and this being more than 12 hours would astronomically make GN. 15 the embolismic year. The present object is to find dates as the Mohammedans find them, and not to show how their calendar can be made more accurate by the small fraction of a day. (Conn. des Temps of 1844, agrees with Ideler.)

(**13**). *Contra* 3*d*. Scaliger (p. 139) gives a table with the embolismic years 2, 5, 8, 10, 13, 16, 19, 21, 24, 27, 30. Here he differs in the years 8, 19, 27, 30.

(**14**). *ME. Rule* 2. To construct the Table. Begin with zero at Month 1, and add alternately 30 and 29 days, making the last month 29 days except in the embolismic years marked K (Kebices) in ME. Rule 1, change the last month from 29 to 30 days. This makes the number of days opposite to the name of the month, the distance from the beginning of the year to the beginning of the month.

(**15**). *Contra*. Ideler, and those who copy his rules, give the same number of days one month earlier. This arrangement is used as an improvement upon the arrangement of Ideler, when finding dates by ME. Rule 3.

(**16**). Ideler gives the first series of the names of the months. Those in parentheses have been found elsewhere. In a note, he says : "These names are written as near as may be to the Arabian language. The Persians and Turks say Dschemasiulewwel, Dschemasiulachir, Ramasan, Ssilhade, Ssilhidsche." And since Ideler writes in German, his names must be pronounced accordingly.

(**17**). *ME. Rule* 3. For date AD. As defined in the beginning, these rules count from July 15 AD. 622 in civil time. Then the constant DAD. (Days AD.) 227,015 is one day less than the *date* AD. 622 July 15, and therefore the *distance* from AD. 1 Jan. 1, to the beginning of ME. Then Q×10,631 is the distance from the beginning of ME., to the beginning of the current cycle. Then GND. opposite to GN. is the distance from the beginning of the current cycle to the beginning of the current year. Then the distance opposite to the name of the month is the distance from the beginning of the year to the beginning of the given month. These are all cardinal numbers, because actual distances from point to point, and at each point require the addition of one day to convert distance into date, because all measures of time (except modern hours and its parts) are ordinals and begin with *One*, not zero. This ordinal *one* is added to convert the sum of the distances into the date required by adding the day of the month which begins with *one*. And NS. SC.=12 days from March 1, 1800, to March 1, 1900, then 13 days to March 1, 2100. Also 10 days from Oct. 5–15, 1582, to March 1, 1700, then 11 days to March 1, 1800. The rules are given in OS., because in OS., every year, including the centurial years AD., which leaves no remainder when divided by 4, is a leap year (JC. 0).

(**18**). *Contra*. All others as far as known, use the rule given by Ideler (p. 466), thus condensed by the use of symbols, viz.: Divide the "past year" ME. by the circle 30, for Q and R. Multiply Q by 10,631. Add the sum in table 2 [ME. Rule 1, with GND. one year earlier] "and the day sum of the past month in

table," [ME. Rule 2, with distances one month earlier] and the day of the month and 227,015. Then divide this sum by 1461 for Q and R. Multiply Q by 4 and add as many times as 365 will go into R, and to these add one for the year, and 2d R=day of Jan.—Example. 29 Schewwal 367. Then the past year 366÷30=Q 12+R 6. Then 12×10,631=127,572+2126 for R 6+226 for 9th Month+29 day of Schewwal+227,015=357,008 sum; ÷1461=Q 244+R 524; 244×4=976+1 for 524÷365, +1=AD. 978, and R=Jan. 159=June 8 (ME. 1st Ex.).

(**19**). Now. Those who prefer Ideler's rule can make the changes enclosed in brackets. But ME. Rules 1, 2, 3 are considered improvements. There are unnecessary complications in Ideler's rules which may cause errors in the calculations. He does not divide the given year, but the "past year" to find Q and R. This subtraction of a year is unnecessary. And it makes his artificial cycle begin one year before ME. began. And it finds R, one year before the year GN. of the cycle, so that it makes the first year of the current cycle, the last year of the previous cycle. And since he does not advance his marks for the embolismic years along with his distances, he will put the embolismic day in the wrong year, unless he takes one year later than he finds by rule. Then he does not take the distance opposite to the name of the given month, but "the day sum of the past month," and in his example uses the number opposite to Ramadan to find the date in Schewwal. And to find the date in Moharrem he must use the number opposite to Dsu-l-hedshe, which will be 354 if the year be a common year or 355 if an embolismic year, with the complications arising from dividing "the past year" by 30.

(**20**). On the contrary, ME. Rule 3 divides the given year by 30, and thus makes the first cycle begin with ME., and gives R the actual GN. of the current cycle. And GN. shows whether the year is embolismic, requiring the last day to be embolismic. And the distances are opposite to the names of the months. And there is no complication in an embolismic year, since the only difference is in counting the last month 30 days when the date happens to fall on that day.

(**21**). *ME. Rule* 4. For AD. into ME. This is the reverse of ME. Rule 3. Nothing analogous has been met with, but may exist. One year is necessarily subtracted from the year AD., to throw the effect of the intercalary in a leap year upon all the dates of the next year.

(**22**). *ME. Rule* 5. For the Ferial. This is the shortest mode in the present case, because DAD. has been found to find the date. And AD. 1, Jan. 1 was Saturday.

(**23**). *ME. Rule* 6 requires no explanation.

(**24**). ME. Examples 1st, 2d, 4th, show the civil date upon which the ME. day begins at sunset, while 3d and 5th show the Mohammedan date one day later by counting the day as beginning on the previous evening, analogous to the Hebrew mode of counting time.

(**25**). The Authors referred to above are Ideler, Lehrbuch der Chronologie, Berlin, 1831, pp. 455–476. And Marsden in the Philosophical Transactions, London, AD. 1788, Vol. 78, pp. 414–432. And Francœur in the Connaissance des Temps, or French Nautical Almanac, Paris, 1844, p. 111. And Journal Asiatique, Paris, 1827, 1st Series, Vol. 2. And Scaliger, De Emendatione Temporum, Geneva, 1629, pp. 135–148. And Rees' Cyclopedia (Hegira). And Nautical Almanacs, English (GNA.), French (PNA.), American (ANA.), which give annually the beginning of the year ME. as in ME. 3d Ex. And Pierce's Universal Lexicon and Oxford Chronological Tables, and Johnson's Cyclopedia (Mohammed), and Weber's Outlines of Universal History.

NC.*

1. NC. = *Nicean Calendar,* or " Alexandrian Canon," was introduced in the century after the Council of Nicea, in AD. 325, to represent the following

2. *Nicean Rule.* The Council gave no astronomic rule, but in general terms decreed that Easter should be held on Sunday on or after the first day of the Passover, and not on the 14th day of Nisan as practised among the Asiatics, who were thence called " Quartodecimans," or Fourteenth day men. This being an astronomic date, and the Egyptians being most skilled in astronomy, the Council commissioned the Bishop of Alexandria to procure this date in advance, in place of the Jewish mode of waiting for the appearance of the new moon, as practised during the Second Temple (NB. AO. 11). " *Ne cum Judæis conveniamus* " (Missal.)

3. This NC. consisted of two parts. The lunar portion was the cycle of 235 new moons in 19 years (= NC. NGN. in NB. GND.), and the solar portion determined " March 21 " to be accounted the Vernal equinox, by what are called the Paschal Canons, viz.:

" 1st. That the 21st day of March shall be accounted the Vernal Equinox. 2d. That the full moon happening upon or next after the 21st day of March, shall be taken for the full moon of Nisan. 3d. That the Lord's day next following shall be Easter day. 4th. But if full moon happen upon a Sunday, Easter shall be the Sunday after " (Wheatly, p. 36). This is given in substance in the Anglican Prayer Books.

4. This calendar was probably the work of the Egyptian astronomers, who had previously predicted the date of Easter as the result of astronomical calculations. The rule (MDB. or MDK.; or MDT. in (NB. AC. 2, 16) shows that new moon fell on March 31, AD. 325 ; and NC. NGN. compared with AU. NGN. in (NB. GND.) shows that the Roman Calendar of BC. 45 was modified by changing the Basic year from BC. 45 to BC. 1 ; or the first year in which AU. recovered from its confusion (NB. AU), and at the same time that one day was subtracted for the lunar recession ; thus agreeing with the actual recession of one day in 308 years when counted in Julian years. Also, March 21 was the artificial maximum Julian Civil date at Jerusalem of the Vernal Equinox in AD. 325 and thereabouts, while its Calendar or actual date in AD. 324, 325, 326, and in each four years before and after these dates it was March 20, and only in AD. 327 and in each third year after leap year about that date was it as late as March 21. (NB. Calendars 18—4). Hence, while retaining the scale of the Roman Cycle, which admits of only a single date as the limit (NB. Scale), they adopted the latest date of the Vernal Equinox, and thus prevented Easter from falling contrary to the Nicean rule on the day of full moon, as it would have done in each third year after Leap year, when full moon fell on March 21 and on Sunday, had March 20, the actual date in AD. 325, been given as the single date of VGND.

5. But NC. NGN. gave only the date of new moon, and to this date, some added 12, others 13, and others 14 days for the full moon of Nisan, until in AD. 527 by common consent the Alexandrian Canon was adopted, and 13 days were added to make the 14th Nisan; on which day Christ was crucified; and this was confirmed by the Council of Chalcedon in AD. 534 in the form of OS. FGN. (OS. 2), and of AM. FGN. (AM. 4), as shown in (NB. GND. 12, 13). (Wheatly, p. 38.)

6. The following historical statements indicate the above : " The Fathers did not give this Canon. The rules are in a letter to the Church of Alexandria. The letter does not exist, but we know the spirit of it." And " the paschal moon was that of which the 14th day coincided with the Vernal equinox or next after " (Delambre, Vol. I., p. 3). " This determination of the equinox is not among the

* See NB. Preface.

Canons of the Council, but may be seen in the Synodic Epistle preserved to us by the two ecclesiastical historians, Socrates and Theodoret;" and "The 14th Nisan being the Jews' Passover" (Long, 1255). "No such Canons are found in the proceedings of the Council," and "The Patriarch of Alexandria was commissioned to announce the time of Easter" (Neale, p. 113; Seabury, p. 76). "The Fathers of the century after the Council of Nicea ordered the new and full moons to be found by the cycle of the moons consisting of 19 years" (Wheatly, pp. 36, 37). Most of the Churches used the ancient Jewish cycle of 84 years" (Brady, p. 295, and Seabury, p. 78, quoting Prideaux). "Passover on 14th of the Paschal month" and "14th Nisan" (Seabury, pp. 70, 73). "The full moon of Nisan was the 14th of the moon's appearance" and "The Roman Church changed its cycle in 455, 457, 525, 1582" (Brady, p. 294). "The 14th of the Calendar month" (Greek "Book of the Litany"). "In AD. 455 S. Pretorius gave Easter correctly April 24, but the Western Church held it April 17" (Neale, p. 113). "No effectual cure was found till Dionysius Exiguus, AD. 525, brought the Alexandrian Canon entire into the Roman Church, and this was adopted with entire unanimity" (Seabury, p. 78, quoting Prideaux). Wheatly (p. 38) gives this cycle of Dionysius = OS. FGN. (NB. GND.) as confirmed by the Council of Chalcedon, AD. 534. "In AD. 527 the Romans abandoned Nisan 16 as the earliest date of Easter, and following Dionysius, adopted Nisan 15, as had previously been used by the Bishops of Alexandria, while the British and old Irish or Scotch had previously used Nisan 14" (Seabury, pp. 87, 88, 89). The decision was first made by the Council of Arles, AD. 314, and confirmed by the Council of Nicea, AD. 325. (Brady, p 295.) (Neale, p. 147.)

CONTRADICTIONS.

(1.) Jarvis (pp. 94, 95) says that the Vernal Equinox had receded from March 25 to March 21 by the "Precession of the Equinoxes" in place of the error of the Julian Calendar. (AC. Notes 94–101.)

(2.) Also, Jarvis (pp. 87–92) gives the full cycle NC. NGN. (NB. GND.) as "established by the Council of Nice."

(3.) All the following assert or imply that the actual date of the Vernal Equinox in AD. 325 was March 21, viz: Long (1255); Montucla (Vol. I., p. 582); Renwick (Vol. II., p. 201); Rees (Calendar); Adams (Roman Year); Missal (De Festibus Mobilibus); Jarvis (pp. 95, 96); Wheatly (pp. 35–38); Seabury (pp. 105, 110, 118). But Seabury (p. 190) quotes the British Act of Parliament of 1751, as "*on* or *about* the 21st day of March." (AC. Notes 12–16.)

(4.) Wheatly (p. 37) says: "For want of better skill in astronomy, the Paschal Canons confined the equinox to March 21."

(5.) Rees (Canon Paschal) and the Encyclopedia Britannica says that NC. is attributed to Eusebius of Cæsarea, and to have been constructed by order of the Council of Nicea. (AC. Notes 1–11, 17–26, 81–131.)

NE.

NE. = ERA OF NABONASSAR.

This ancient Egyptian calendar was taken to Babylon, and counts from JP. 3967 February 26.

NE. Rule 1. For NE. into JP. Multiply the year NE. by 365, and to P add the day of Thoth (Rule 3d), and the constant 1,448,272 and S=DJP., which reduce (A).

NE. Rule 2. For JP. into NE. From DJP., subtract 1,448,272. Divide R by 365 for Q=year NE., and 2d R=day of Thoth, which reduce by Rule 4.

NE. Rule 3. For the day of Thoth, add the given day of the given month, to the number prefixed to that month, in the following table: 0+Thoth; 30+Paōpi; 60+Athyr; 90+Choiak; 120+Tybi; 150+Mecheir; 180+Phamenōth; 210+Pharmouthi; 240+Pachōn; 270+Payni; 300+Epiphi; 330+Mesori; 360+Epagomenai, of which there were 5=365 days in a year NE.

NE. Rule 4. For the day of the month. From the day of Thoth, subtract the numbers in the table in Rule 3, which is next less than the day of Thoth, and R= day of the month, to which that number is prefixed.

NE. 1st Ex. Lunar eclipse at Babylon NE. 27, Thoth 29 at 9 hours 30 minutes after noon: Then 27×365+29+1,448,272=DJP. 1,458,156. Then DJP. 1,458,156−365 ;÷1461=Q 997+R 1174 ;÷365=2d Q 3+Jan. 79. Then 997×4+2d Q 3+ constant 2=JP. 3993. Then 3993−1 ;÷4 leaves JC. 0 (bissextile) and Jan. 79= March 19 at 9 h..30 m. after noon.

NE. 2d Ex. Summer solstice at Athens NE. 316, Phamenoth 21, at 5 or 6 hours after midnight. Then Phamenoth 21+180=Thoth 201. And NE. 316 Thoth 201 =DJP. 1,563,813=JP. 4282 June 27, at 5 or 6 hours after midnight.

NE. 3d Ex. Scaliger (pp. 198–9). JP. 4713 Aug. 23. Then JP. 4713−1 ;÷4 leaves JC. 0, and Aug. 23=Jan. 236. Then .4713−2 ;÷4=Q 1177+R 3; 1177× 1461+3×365+constant 365+Jan. 236=DJP. 1,721,293. Then 1,721,293−constant 1,448,272 ;÷365=Q 748=year NE.+R 1=Thoth 1st.

NE. 4th Ex. Lunar eclipse at Alexandria NE. 366 Thoth 27 at 6 h..30 m. after midnight (Jarvis, p. 119). Then NE. 366 Thoth 27=DJP. 1,581,889=JP. 4331 Dec. 23 at 6 hours 30 min. after midnight.

NE. 5th Ex. Lunar eclipse at Alexandria NE. 547 Mesori 16th, at 7 hours after noon (Jarvis, p. 120). Then Mesori 16+330=Thoth 346. And NE. 547 Thoth 346=DJP. 1,648,273=JP. 4513 Sept. 22 at 7 hours P.M.

NE. 6th Ex. Censorinus (Jarvis, p. 120) says that in NE. 986, Thoth 1st fell on June 25. Then 986×365+1+1,448,272=DJP. 1,808,163=JP. 4951 June 25.

NE. 7th Ex. AE. began JP. 4685 Aug. 30 (in JC. 0)=Jan. 243=DJP. 1,711,073; −1 448,272=262,801 ;÷365=Q 720=NE. 720+R 1=Thoth 1st. But the Romans called this August 29. (JE., AE.)

NE. NOTES.

NE.=ERA OF NABONASSAR=ANCIENT EGYPTIAN CALENDAR.

(**1**). As to Rules 1 and 2. NE. began JP. 3967 Jan. 57=DJP. 1,448,638. Then to leave room for NE. 1×365+Thoth 1, subtract 366 and leave the constant 1,448,-272.

(**2**). The examples compared with astronomic dates by MD. in the Appendix, prove that both rules are correct—observing that MD. gives the mean date, from which the date of actual full moon varied 0.568 *more and less* than the mean, in the standard cycle of variations, from 1853 Sept. 17..10 h..12 m., to 1854 March 14..17 h..53 minutes standard time.

(**3**). *As to* 1*st Ex.* This is the earliest definite date of an eclipse, 2600 years before AD. 1880, and 114 years before the Jewish Captivity. It is quoted by Tycho Brahe (Prol., p. 3) from Ptolemy of Alexandria (Alm. Lib. 4, Chap. 6). The date here found is JP. 3993 March 19.895,833 counted from midnight, while MD. 2d Ex. makes mean full moon fall JP. 3993 March 19.467,827 counted from midnight at Babylon. Hence the actual was 0.428 *more* than the mean. (2, 17, 19–35.)

(**4**). *As to* 2*d Ex.* This is the earliest solar date on record, 2300 years before AD. 1869, as determined by Meton and Euctemon as the basis of the Olympic Era (OE.). It is given by Tycho Brahe (Prol., p. 6). They made the date 5 or 6 hours after midnight, while MD. 4th Ex. makes the date at Athens 8 hours 5 minutes after midnight. The difference of 2 hours is probably as near as they were able to determine the time when the sun was furthest north; by the shadow of an obelisk and without the assistance of modern time-keepers. (17.)

(**5**). *As to* 3*d Ex.* This is given to compare with Scaliger's mode of reduction. (10.)

(**6**). *As to* 4*th Ex.* This eclipse fell JP. 4331 Dec. 23.270,833 counted from midnight. MD. makes mean full moon fall JP. 4331 Dec. 23.597,137 counted from midnight at Alexandria, so that the actual was 0.326,304 *less* than the mean. Jarvis (p. 119) says that this is in Ptolemy's fourth book, and uses this example to show his mode of reduction, and to prove that NE. began JP. 3967 Feb. 26. (2, 12.)

(**7**). *As to* 5*th Ex.* The eclipse fell JP. 4513 Sept. 22.791,667, while MD. makes mean full moon fall JP. 4513 Sept. 22.361,209 at Alexandria. Hence the actual was 0.430,458 *more* than the mean (2). Jarvis (p. 120) says that Petavius calculates this eclipse at Sept. 22 7 h..15 m. P.M.=Sept. 22.802,083.

(**8**). *As to* 6*th Ex.* This verifies NE. Rule 1.

(**9**). *As to* 7*th Ex.* This proves that the imperial edict made no change in the

first year of the Actian Era, but required that thereafter Thoth 1st must always fall on the same Roman date as it did in the first year. (AE.)

(**10**). These NE. rules are original and more simple than the rules given by Scaliger (pp. 198–206), and by Jarvis (pp. 118–120). The 3d Example is thus reduced by Scaliger: "Example. The common year of Christ....is JP. 4713. Subtract 3967 from 4713 leaves 747 Julian years, from the end of December 3967 to the end of December 4713; but under the ratio of NE. from Feb. 26..3967 to Feb. 26.. 4713. Therefore subtract 56 days and there remain 746 solid Julian years and 309 days. The Julian Bissextiles for 746 years, that is 186 days compounded with 309 days make 495, that is one Egyptian year and 130 days. Therefore from the 1st Thoth NE. to the end of JP. 4713 are 747 absolute Egyptian years and 130 days, besides the days of NE. 748 unfinished. Subtract 130 from 365 and there remain 235 days from the Kalends of January, terminating in August 23 inclusive. Therefore Thoth 1st fell at that date." (5.)

(**11**). This requires more figuring than the present rule, with the greater objection, that the *principles* must be constantly kept in mind and properly applied to prevent false results. While the present rules, like all the other rules herein, are prepared to be worked by rote, so that the whole attention may be devoted to the accuracy of the figuring.

(**12**). Jarvis (p. 119) reduces the 4th Example thus: "The first step to be taken is to turn the Egyptian into Julian or Roman years; and this is done by multiplying them by 365 to turn them into days, then dividing them by 1461 the number of days in four Roman years, and multiplying the quotient by 4. The remainder will be the number of days in the next Roman year. As Thoth is the first month in the 366th Egyptian year, and the eclipse took place 6 h..30 m. after midnight on the 27th of that month, the sum must be stated thus:

365 y. 26 d. 6 h. 30 m.	1461) 133,251 (91
365	4
	Rem. 300 | 364

Days 133,251, 6 h. 30 m.=R. y. 364, 300 d. 6 h. 30 m. From the 1st of January to the 22d December inclusive in the year 4331 of the Julian Period were 356 days.

Therefore from A. J. P.	4330..	356 d.	6 h.	30 m.
Subtract	364	300	6	30
And there remain	3966	56	0	0

Fifty-six days are equal to Jan. 31 to Feb. 25. Consequently, the Æra of Nabonassar began on the 26th of February, in the year 3967 of the Julian Period."

(**13**). Newton (Vol. 5, p. 284) says that the Egyptian mode of counting time—which he calls "Thoth"—was taken to Babylon in JP. 3967, when Thoth fell 33 days 5 hours before the vernal equinox. The above examples prove that NE. counts from JP. 3967 Feb 26. Rees (Epocha) says that NE. began Feb. 26 at noon. But Long (Sec. 1211) quotes Censorinus, who says, that the Egyptians and ancient Romans counted from midnight.

(**14**). Jackson (Vol. 2, p. 8) says that Thoth=Sothis=Isis=Egyptian Venus=Sirius=Dog Star. That Geminus of Rhodes, says that in his time (BC. 77) the heliacal rising of Sirius was 30 days after the Summer Solstice. And (p. 9) that

Pliny says, that the Dog Star rose when the sun entered Leo, 15 days before the Kalends of August (July 18).

(**15**). This heliacal rising of the Dog Star was at that time a very important date in Egypt, since at that time the Nile began its annual rise. The near approach of this time was indicated by the heliacal rising of *a* Canis Minoris, which was called Procyon, from the Greek Prokuōn=before the dog. And Dog-days derived their name from the rising of the Dog Star. But the precession of the equinoxes now causes Sirius to rise about a month later in equinoxial time, so that it no longer has the same importance as about 2000 years ago. (26.)

(**16**). This year was called the "Wandering Year," because it uniformly contained 365 days, and therefore receded a full Julian year in 1460 Julian years. It was also called the Canicular year, from Canicula the Dog Star. And the great Egyptian period was counted from the "Year of God" (*i. e.*, of Sothis) when Thoth 1st coincided with the heliacal rising of Canicula, to the same sidereal period. And calculation makes this period about 1508 mean years in consequence of the precession of the equinoxes. (26.)

(**17**). This mode of recording astronomical phenomena is the best that has ever been used. And Scaliger (p. 431) says that "these years of the Chaldeans were not political and never were so, but mathematical." And Jarvis (pp. 118, 119) says that Ptolemy of Alexandria has "transmitted to us the oldest astronomical calculations known, which under the direction of Aristotle (BC. 300 cir.), had been transmitted by Callisthenes from Babylon to Greece, and afterwards adjusted by Hipparchus of Alexandria to the Egyptian mode of computing time." (3, 4, 21.)

(**18**). But, although NE. carries the name of Nabonassar, while it was only used by the astronomers of Babylon, it was evidently the popular calendar of the Egyptians, since the Actian Era of the Egyptians was the same as NE. with 12 consecutive months of 30 days and 5 *epagomenai*, except that an extra *epagomenas* was added by order of Augustus in the same year as the Roman bissextile, so that Thoth 1st should always fall on the Roman August 29. (9; AE. Notes; HC. Notes 115, 124; 139–156.)

(**19**). The New York *Observer* of Nov. 26, 1885, has the following:

"Professor Sayce, in the *Academy*, writes of the *Phainomena* or *Heavenly Display* of Aratos. . . . . Of the original work, he says that it is not only 'curious and interesting of itself, but also valuable for the history of astronomy.' It is, in fact, a versification of the astronomical lore of Eudoxos, and though the astronomical knowledge of Eudoxos was probably but slight, while that of the poet was still less, it embodies the traditional information of the Greeks about astronomical matters which we now know to have been derived by them from the East. It consequently formed the starting-point of later scientific Greek astronomy. Mr. Brown not only believes that the poem embodies the ideas ultimately derived from Babylonia, but that the configuration of the stars as described by Aratos is itself of Babylonian origin, and belongs to the second millennium before the Christian era. It is certainly inconsistent with the positions of the constellations in the time of Eudoxos or Aratos, while a map attached by Mr. Brown to his third appendix shows how closely it agrees with the positions of the principal stars near the equator at the time of the equinox 2084 BC. In the *Phainomena* of Aratos, consequently, we have to see not a Greek chart of the heavens as they appeared in the fifth or third century BC., but a traditional representation of the stellar sky, as mapped out by Babylonians two thousand years before." (3, 24–26.)

(20). "The decipherment of the cuneiform inscriptions has proved two things, both of them, indeed, already divined by scholars, but from the nature of the case previously unverifiable. One of these is the fact that the signs of the zodiac were of Babylonian invention, the other that the configuration of the celestial globe took the shape in which it was received by the Greeks between BC. 2500 and 2000. The precession of the equinoxes prevents our placing it earlier than about BC. 2500, since before that date the sun at the vernal equinox would have entered Taurus, and not the first point of Aries, while the zodiacal cycle, as we find it in Babylonian and Greek astronomy, begins with Aries. Accordingly, in my memoir on Babylonian astronomy, published eleven years ago, I concluded that the invention of the Babylonian calendar, and the beginning of systematized Babylonian astronomy, must be assigned to about BC. 2000, though I admitted that the numerous records of eclipses incorporated in this systematized astronomy implied an enormous antiquity for the star-gazing Chaldeans." (22–35.)

(21). "Mr. Furlong adds: 'I believe we may get near to its true date through Porphyry. He wrote that Callisthenes brought the Babylonian standard work on astronomy to Greece 2000 years before the time of Alexander the Great, so that the configuration of the stars and zodiacal figures, which Eudoxos and afterward Aratos and Hipparchus manipulated, would be at least as old as 2350 BC. I regret I have no books near me wherewith to follow up this subject.' The Chinese date their astronomical cycle and zodiac from 2640 BC." (3, 17, 37, 38.)

(22). In the same direction, Smyth's Celestial Cycle (Vol. 2, p. 314) says of Thuban (*a* Draconis): "Upwards of 4600 years ago it was the pole star of the Chaldeans, being then within 10′ of the polar point; a point which will not be approached by *a* Ursa Minoris [the present pole star] nearer than 26′..30″. *a* Draconis in that remote age must have seemed stationary during the apparent revolution of the celestial sphere about the northern extremity of the polar axis; though now it has by the slow movement to which the stellar host is subjected deviated from the pole as much as 24°..52′."

(23). Now: The earliest definite astronomic date on record is given in NE. Example 1st at BC. 721. This is a historic fact. But the position of the stars at any date can be determined by calculation. The Admiral fixes the date BC. 2700, when the polar point was within 10′ of Thuban. And he speaks as if the Chaldeans were witnesses of that fact. But this is in his usual playful mode of describing astronomic facts. And he may not have thought of its bearing on history, since Ussher fixes the date of the Flood at BC. 2349. (3.)

(24). On the contrary, the Professor's remarks refer to history, and he brings in evidence the writings of Aratos, Eudoxos, and Porphyry to prove that the Babylonian zodiac was framed about BC. 2500 or 2350. Now, Lempriere's Classical Dictionary says that Aratos wrote about BC. 277, and Eudoxos died BC. 352, and Porphyry died AD. 304. So that the earliest of these witnesses lived about 2000 years after these dates, and probably did not know what changes had been made before their time. Even the Jews do not know when the beginning of their year was changed from Nisan to Tisri. But they do know that the change has been made within the last 2000 years. (HC. Notes.)

(25). These writers are good witnesses to prove that in their day the zodiac began with Aries, and that tradition made the zodiac begin with Aries as far back as was known. And the Professor shows that Aries could not have been the first sign of

the zodiac before BC. 2500. But he does not state that for the same reason calculation cannot define the date when Aries was established as the first sign of the zodiac at any year between BC. 2500 and about BC. 250. Thus:

(26). Hamal (*a* Arietis) is the brightest star in the constellation Aries, and near its western border, so that if not the ancient "first point of Aries," it must be very near it. In 1886, the Right Ascension of Hamal is 2 hours and 0 minutes..44.86 sec., or about 30 degrees, or one sign of the zodiac, East of the modern First point of Aries, which is the point where the sun crosses the Equator in the spring. The precession of the equinoxes at the present rate of 50.2601 seconds in arc per year, carries this point westward among the stars one sign, or 30 degrees, in about 2150 years, so that stars on the ecliptic increase two hours in Right Ascension in about 2150 years. But Hamal is not on the ecliptic and the nautical almanac gives its annual variation 3.3685 seconds, so that it increases two hours in Right Ascension in 2137 years. Hence about 2137 years ago, or BC. 250, the modern First point of Aries coincided with Hamal. And Hamal is certainly in the constellation Aries if it be not the ancient first point of Aries. The British Association Catalogue gives the right ascension of *Hamal,* or *a* Arietis, in 1850 as 1 h..58 m..43.58 sec., and Annual Precession 3.348 seconds. This would make a small difference, but not enough to affect the general result.

(27). As to the remark, that: "the numerous records of eclipses, incorporated in this systematic astronomy, implied an enormous antiquity for the star-gazing Chaldeans." Professor Renwick, in his lectures to the Class of 1824 in Col. Coll., New York, referred to these eclipses in substance thus, according to my recollection.

(28). The scientists who accompanied Napoleon in his Eastern expedition found a Chaldean account of their own nation, which carried its origin back to an immense antiquity, to a period called Kali Yug when all the planets were in a direct line from the sun. And in tracing down the national history they frequently referred to eclipses.

(29). This being reported, and the eclipses agreeing with calculation, produced consternation among those who had believed the Mosaic account. This was only partially removed by the thought that eclipses could be calculated backwards as well as forwards.

(30). Now, go back to the Second School of Plato. They had investigated the curves of the Conic Sections. These were simply mathematical curiosities until the time of Newton. He found that these curves agreed precisely with the laws of gravity which he had investigated. And his laws of gravity explained the movements of all the heavenly bodies except that of the moon, and he laid his work aside as defective.

(31). Then, there was no certainty that the measures of length, capacity, and weight had remained unchanged. Some unchangeable measure in nature was sought. The English proposed to make the standard of length, the pendulum beating seconds at a certain latitude. The French measured an arc of the meridian of the earth, and carried on a simultaneous trigonometrical survey for distance, and astronomical observations for latitude. Having passed a mountain, they found that the change in latitude made the earth smaller than they knew it to be. They repeated their work to find the error, but with the same result. They then recognized the fact, that the error was caused by the attraction of the mountain.

(**32**). This having been made known, an English and a French astronomer made independent observations as to the attraction of mountains, with the same results that the weight of the earth is about five times as great as an equal bulk of water.

(**33**). From the weight of the earth, the weight of each body in the solar system has been determined. The measure of the earth proved that it was larger than Newton had assumed it to be. He corrected this error, and his laws of gravity explained the movements of *all* the heavenly bodies, and they were given to the public. These explain the irregularities in the movements of the planets, the attraction of one sometimes retarding, sometimes accelerating the movement of the other. And since this lecture was delivered, the accuracy of modern astronomical knowledge has been proved, by Leverrier's discovery of the most distant planet in our system, by calculating the size and position of a planet, that would account for the observed irregularity of the most distant planet that was then known.

(**34**). Now, said Professor Renwick, when these modern discoveries are applied to these Chaldean statements, it is found that the planets were scattered through the heavens at the time that the Chaldeans state that they were all in a direct line from the sun, and that the eclipses did not fall at the times they state, and these once celebrated eclipses are now acknowledged by all to be fictitious.

(**35**). As to the cuneiform inscriptions: These, when deciphered, may be found to be the same as the above Chaldean statements, or something similar. But in the above, there is no astronomic proof that Archbishop Ussher errs in giving BC. 2349 as the date of the Flood, in accordance with the Mosaic account. (20.)

(**36**). Jarvis (p. 18), after many quotations from ancient authors to prove that the Olympiads began JP. 3938=B.C. 776, says: "From the first Olympiad of Iphitus only, does profane history derive its definite form, and detach itself entirely from traditional conjecture." And Petavius calls this the "torch-light of ancient history." (OE. Notes.)

(**37**). Newton's Chronology, London, 1725 (p. 80), says that the Thebans determined the length of the solar year by the heliacal rising of the stars, and added 5 days to the previous year of 12 months of 30 days. "This being at length propagated into Chaldea gave occasion for the year of Nabonassar....This year was received by the Persian empire from the Babylonians. And the Greeks also used it in the Era Philippœa, dated from the death of Alexander the Great. And Julius Cæsar corrected it by adding one day in every 4 years" (p. 81). The 5 days were added by the last king of the shepherds (p. 82). Eudoxos, 60 years after Meton, in describing the sphere of the ancients, placed the solstices and equinoxes in the middle of the constellations Aries, Cancer, Chelæ, and Capricorn (p. 84). The first Greek sphere was for the Argonauts, and the names of the constellations are Argonautic (p. 86). In 1689 the equinox had receded 36 degrees, 44 minutes, since the Argonautic expedition (p. 87). This puts the expedition about 25 years after the death of Solomon (p. 93). Hipparchus discovered the precession of the equinoxes about one degree in 100 years, between NE. 586 and 618. The middle year, NE. 602, is 286 years after Meton. (19–21.)

(**38**). This statement by Newton, that Eudoxos puts the equinox about the middle of Aries shows that the zodiac, as described by Eudoxos, was constructed about BC. 1320, and not BC. 2350. (21–35.)

NS.

PREFACE.

NS.=NEW STYLE=GREGORIAN CALENDAR.

The origin of NS. is given in AC. Notes 1–16. Its departures from the Nicean rule in AC. Examples 1st, 2d, 3d, and in AC. Notes 40, 48–51, 66–70, 72, 73, 78–80, 89–91, 123, and Authors in AC. Note 132, and HC. Notes, at the beginning.

EXPLANATIONS.

The stereotype plates of the edition of 1874 are used in this edition for AM.; GND. and Epacts; NC.; NS.; NS. Notes; OS.; and Scale. But the papers on AC.; AC. Notes; HC.; HCM., HC. Notes; and JE.; have been extended, and some of the symbols have been changed. Therefore in these pages of 1874, in this edition, read

AC. numbers=AC. without the numbers.

AO.=HC.; and AOC.=HCM.; and NB. AO.=HC. Notes without the numbers.

AU.=JE., and AU.

NB.=Notes respecting what follows NB.

NB. GND. and Epacts=GND. and Epacts, as a separate paper in alphabetical order.

NB. NC.=NC. as a separate paper.

NB. Scale=Scale as a separate paper.

NS. 1, 2, etc.=NS. Rule 1, 2, etc.

MOVEABLE FEASTS.

Years, A.D.	Golden Number.	Epact.	Dominical.	Sundays after Epiphany.	Septuagesima Sunday.	Ash Wednesday.	Easter Sunday.	Rogation Sunday.	Ascension (Thurs.) Day	Whit-Sunday.	Sundays after Trinity.	Advent Sunday.
1874	13	12	D	3	Feb. 1	Feb. 18	Apr. 5	May 10	May 14	May 24	25	Nov. 29
1875	14	23	C	2	Jan. 24	“ 10	Mar. 28	“ 2	“ 6	“ 16	26	“ 28
1876	15	4	b. A	5	Feb. 13	Mar. 1	Apr. 16	“ 21	“ 25	June 4	24	Dec. 3
1877	16	15	G	3	Jan. 28	Feb. 14	“ 1	“ 6	“ 10	May 20	26	“ 2
1878	17	26	F	5	Feb. 17	Mar. 6	“ 21	“ 26	“ 30	June 9	23	“ 1
1879	18	7	E	4	“ 9	Feb. 26	“ 13	“ 18	“ 22	“ 1	24	Nov. 30
1880	19	18	d. C	2	Jan. 25	“ 11	Mar. 28	“ 2	“ 6	May 16	26	“ 28
1881	1	0	B	5	Feb. 13	Mar. 2	Apr. 17	“ 22	“ 26	June 5	23	“ 27
1882	2	11	A	4	“ 5	Feb. 22	“ 9	“ 14	“ 18	May 28	25	Dec. 3
1883	3	22	G	2	Jan. 21	“ 7	Mar. 25	Apr. 29	“ 3	“ 13	27	“ 2
1884	4	3	f. E	4	Feb. 10	“ 27	Apr. 13	May 18	“ 22	June 1	24	Nov. 30
1885	5	14	D	3	“ 1	“ 18	“ 5	“ 10	“ 14	May 24	25	“ 29
1886	6	25	C	6	“ 21	Mar. 10	“ 25	“ 30	June 3	June 13	22	“ 28
1887	7	6	B	4	“ 6	Feb. 23	“ 10	“ 15	May 19	May 29	24	“ 27
1888	8	17	a. G	3	Jan. 29	“ 15	“ 1	“ 6	“ 10	“ 20	26	Dec. 2
1889	9	28	F	5	Feb. 17	Mar. 6	“ 21	“ 26	“ 30	June 9	23	“ 1
1890	10	9	E	3	“ 2	Feb. 19	“ 6	“ 11	“ 15	May 25	25	Nov. 30
1891	11	20	D	2	Jan. 25	“ 11	Mar. 29	“ 3	“ 7	“ 17	26	“ 29
1892	12	1	c. B	5	Feb. 14	Mar. 2	Apr. 17	“ 22	“ 26	June 5	23	“ 27
1893	13	12	A	3	Jan. 29	Feb. 15	“ 2	“ 7	“ 11	May 21	26	Dec. 3
1894	14	23	G	2	“ 21	“ 7	Mar. 25	Apr. 29	“ 3	“ 13	27	“ 2
1895	15	4	F	4	Feb. 10	“ 27	Apr. 14	May 19	“ 23	June 2	24	“ 1
1896	16	15	e. D	3	“ 2	“ 19	“ 5	“ 10	“ 14	May 24	25	Nov. 29
1897	17	26	C	5	“ 14	Mar. 3	“ 18	“ 23	“ 27	June 6	23	“ 28
1898	18	7	B	4	“ 6	Feb. 23	“ 10	“ 15	“ 19	May 29	24	“ 27
1899	19	18	A	3	Jan. 29	“ 15	“ 2	“ 7	“ 11	“ 21	26	Dec. 3
1900	1	29	G	5	Feb. 11	Feb. 28	Apr. 15	May 20	“ 24	June 3	24	“ 2
1901	2	10	F	3	“ 3	“ 20	“ 7	“ 12	“ 16	May 26	25	“ 1
1902	3	21	E	2	Jan. 26	“ 12	Mar. 30	“ 4	“ 8	“ 18	26	Nov. 30
1903	4	2	D	4	Feb. 8	“ 25	Apr. 12	“ 17	“ 21	“ 31	24	“ 29
1904	5	13	c. B	3	Jan. 31	“ 17	“ 3	“ 8	“ 12	“ 22	25	“ 27
1905	6	24	A	6	Feb. 19	Mar. 8	“ 23	“ 28	June 1	June 11	23	Dec. 3
1906	7	5	G	5	“ 11	Feb. 28	“ 15	“ 20	May 24	“ 3	24	“ 2
1907	8	16	F	2	Jan. 27	“ 13	Mar. 31	“ 5	“ 9	May 19	26	“ 1
1908	9	27	e. D	5	Feb. 16	Mar. 4	Apr. 19	“ 24	“ 28	June 7	23	Nov. 29
1909	10	8	C	4	“ 7	Feb. 24	“ 11	“ 16	“ 20	May 30	24	“ 28
1910	11	19	B	2	Jan. 23	“ 9	Mar. 27	“ 1	“ 5	“ 15	26	“ 27
1911	12	0	A	5	Feb. 12	Mar. 1	Apr. 16	“ 21	“ 25	June 4	24	Dec. 3
1912	13	11	g. F	4	“ 4	Feb. 21	“ 7	“ 12	“ 16	May 26	25	“ 1
1913	14	22	E	1	Jan. 19	“ 5	Mar. 23	Apr. 27	“ 1	“ 11	27	Nov. 30
1914	15	3	D	4	Feb. 8	“ 25	Apr. 12	May 17	“ 21	“ 31	24	“ 29
1915	16	14	C	3	Jan. 31	“ 17	“ 4	“ 9	“ 13	“ 23	25	“ 28
1916	17	(25)	b A	6	Feb. 20	Mar. 8	“ 23	“ 28	June 1	June 11	23	Dec. 3
1917	18	6	G	4	“ 4	Feb. 21	“ 8	“ 13	May 17	May 27	25	“ 2
1918	19	17	F	2	Jan. 27	“ 13	Mar. 31	“ 5	“ 9	“ 19	26	“ 1
1919	1	29	E	5	Feb. 16	Mar. 5	Apr. 20	“ 25	“ 29	June 8	23	Nov. 30
1920	2	10	d. C	3	“ 1	Feb. 18	“ 4	“ 9	“ 13	May 23	25	“ 28
1921	3	21	B	2	Jan. 23	“ 9	Mar. 27	“ 1	“ 5	“ 15	26	“ 27
1922	4	2	A	5	Feb. 12	Mar. 1	Apr. 16	“ 21	“ 25	June 4	24	Dec. 3
1923	5	13	G	3	Jan. 28	Feb. 14	“ 1	“ 6	“ 10	May 20	26	“ 2
1924	6	24	f. E	5	Feb. 17	Mar. 5	“ 20	“ 25	“ 29	June 8	23	Nov. 30
1925	7	5	D	4	“ 8	Feb. 25	“ 12	“ 17	“ 21	May 31	24	“ 29
1926	8	16	C	3	Jan. 31	“ 17	“ 4	“ 9	“ 13	“ 23	25	“ 28
1927	9	27	B	5	Feb. 13	Mar. 2	“ 17	“ 22	“ 26	June 5	23	“ 27
1928	10	8	a. G	4	“ 5	Feb. 22	“ 8	“ 13	“ 17	May 27	25	Dec. 2
1929	11	19	F	2	Jan. 27	“ 13	Mar. 31	“ 5	“ 9	“ 19	26	“ 1
1930	12	0	E	5	Feb. 16	Mar. 5	Apr. 20	“ 25	“ 29	June 8	23	Nov. 30

Note.—Trinity Sunday is seven days after Whit-Sunday.

(NS. 2.) **(1) TABLE II.—To Find Table IV.**

Centurial Bissextiles.	Years of change of Index.	NS. Index.	NS. SC.	NS. LC.	Centurial Bissextiles.	Years of change of Index.	NS. Index.	NS. SC.	NS. LC.	Centurial Bissextiles.	Years of change of Index.	NS. Index.	NS. SC.	NS. LC.	Centurial Bissextiles.	Years of change of Index.	NS. Index.	NS. SC.	NS. LC.
	325	24	0	0		3500	9	25		B	5600	17				7700	26	56	24
	1582	0	10	4	B	3600	8		11		5700	18	41			7800	27	57	
B	1600	0				3700	9	26			5800	18	42	18		7900	28	58	
	1700	1	11			3800	10	27			5900	19	43		B	8000	27		25
	1800	1	12	5		3900	10	28	12	B	6000	19				8100	28	59	
	1900	2	13		B	4000	10				6100	19	44	19		8200	29	60	
B	2000	2				4100	11	29			6200	20	45			8300	29	61	26
	2100	2	14	6		4200	12	30			6300	21	46		B	8400	29		
	2200	3	15			4300	12	31	13	B	6400	20		20		8500	0	62	
	2300	4	16		B	4400	12				6500	21	47						
B	2400	3		7		4500	13	32			6600	22	48						
	2500	4	17			4600	13	33	14		6700	23	49						
	2600	5	18			4700	14	34		B	6800	22		21					
	2700	5	19	8	B	4800	14				6900	23	50						
B	2800	5				4900	14	35	15		7000	24	51						
	2900	6	20			5000	15	36			7100	24	52	22					
	3000	6	21	9		5100	16	37		B	7200	24							
	3100	7	22		B	5200	15		16		7300	25	53						
B	3200	7				5300	16	38			7400	25	54	23					
	3300	7	23	10		5400	17	39			7500	26	55						
	3400	8	24			5500	17	40	17	B	7600	26							

(2). Memorized rules which include the Index (NS. 20, 21). (See NS. and AC. 2, 14, 15, 16, 20, 21, 22, 24, 27 ; and AOC. 1 ; **NB.** NS. 2, 16 ; 31 to 35 ; **NB.** Cal. 18—9, 10.)

(3.) (**NB.** NS. 1 to 7.) Table I. is not always given, but the rules to find these dates are always found in the Anglican Prayer Books and in the Roman Missal.

Table II. is the Anglican Table II. with the addition of A D. 325, and 1582, and columns of NS. SC. and NS. LC. to illustrate its construction by NS. 16.

Table III. is the Anglican Table III with the addition of the column of Epacts to be used with Table VII. These are found by adding 13 days to the dates of the same Epacts for the Paschal New Moon in the Missal. This column, with the assistance of the Anglican Tables II., III., will, for all time, show the 30 changes of Epacts during each Great Cycle. The Missal gives two tables and 52 lines of printing for the single change of Epacts, here represented by the change from Index 0 to 1, for Epacts from A D. 1582 to 1899, and refers to a nameless " book " for further information. Long (1266–8) gives three tables, here represented by Indexes 0, 1, 2 ; and says that Clavius gives 30 series of Epacts and tables up to A D. 303, 300. Delambre (V. 1, p. 18) says that Clavius gives 217 combinations. See Jarvis (p. 107) ; Wheatly (pp. 37–47) ; Rees (Cycle and Number ; Seabury (p. 201). For the memorized rule see (NS. 14).

Table IV. is found in all the Anglican Prayer Books, except the day of March for the memorized rules to find the date of the Paschal Full Moon, by GN. and by Epacts (NS. 14) ; and the double dates April 17, 17, April 18, 18 ; and the Epacts, with Epact (25) extra which, in all cases, belongs only to GN 12 to 19 ; to illustrate NS. Retractions.

Table V. is found in works on the calendar, except that it is here shown to be perpetual by the mode of finding the centuries.

Table VI is found in Anglican Prayer Books.

Table VII. is copied from the Roman Missal, with slight modifications.

The voluminous series of Greek Service Books and large Book of Rubrics, contain no part of the Russo-Greek Calendar.

TABLE III.—To Find Table IV.

Day of March, NS. FGND.	Day of the Month, Paschal, Full Moon.	Sunday Letters.	Epacts.	GOLDEN NUMBERS. I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX
21	March 21	C	23	8	19	O	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26
22	" 22	D	22	9	20	1	12	23	4	15	26	7	18	29	10	21	2	13	24	5	16	27
23	" 23	E	21	10	21	2	13	24	5	16	27	8	19	O	11	22	3	14	25	6	17	28
24	" 24	F	20	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29
25	" 25	G	19	12	23	4	15	26	7	18	29	10	21	2	13	24	5	16	27	8	19	O
26	" 26	A	18	13	24	5	16	27	8	19	O	11	22	3	14	25	6	17	28	9	20	1
27	" 27	B	17	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29	10	21	2
28	" 28	C	16	15	26	7	18	29	10	21	2	13	24	5	16	27	8	19	O	11	22	3
29	" 29	D	15	16	27	8	19	O	11	22	3	14	25	6	17	28	9	20	1	12	23	4
30	" 30	E	14	17	28	9	20	1	12	23	4	15	26	7	18	29	10	21	2	13	24	5
31	" 31	F	13	18	29	10	21	2	13	24	5	16	27	8	19	O	11	22	3	14	25	6
32	April 1	G	12	19	O	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7
33	" 2	A	11	20	1	12	23	4	15	26	7	18	29	10	21	2	13	24	5	16	27	8
34	" 3	B	10	21	2	13	24	5	16	27	8	19	O	11	22	3	14	25	6	17	28	9
35	" 4	C	9	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29	10
36	" 5	D	8	23	4	15	26	7	18	29	10	21	2	13	24	5	16	27	8	19	O	11
37	" 6	E	7	24	5	16	27	8	19	O	11	22	3	14	25	6	17	28	9	20	1	12
38	" 7	F	6	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29	10	21	2	13
39	" 8	G	5	26	7	18	29	10	21	2	13	24	5	16	27	8	19	O	11	22	3	14
40	" 9	A	4	27	8	19	O	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15
41	" 10	B	3	28	9	20	1	12	23	4	15	26	7	18	29	10	21	2	13	24	5	16
42	" 11	C	2	29	10	21	2	13	24	5	16	27	8	19	O	11	22	3	14	25	6	17
43	" 12	D	1	O	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18
44	" 13	E	0	1	12	23	4	15	26	7	18	29	10	21	2	13	24	5	16	27	8	19
45	" 14	F	29	2	13	24	5	16	27	8	19	O	11	22	3	14	25	6	17	28	9	20
46	" 15	G	28	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29	10	21
47	" 16	A	27	4	15	26	7	18	29	10	21	2	13	24	5	16	27	8	19	O	11	22
48	" 17	B	26	5	16	27	8	19	O	11	22	3	14	25	6	17	28	9	20	1	12	23
48	" 17	B	(25)	..	..	..	..	..	..	..	..	..	..	..	7	18	29	10	21	2	13	24
49	" 18	C	25	6	17	28	9	20	1	12	23	4	15	26	..	..	..	..	.	..	..	..
49	" 18	C	24	7	18	29	10	21	2	13	24	5	16	27	8	19	O	11	22	3	14	25

(2) Memorized rules for all the quantities in Table III. (NS. 12, 14.) (See NS. and AC. 1, 3, 4, 7, 9, 11 to 15, 20, 21; **NB.** NS. 3, 14; 31 to 35; and OS, 2; and AM. 3; and AO. 5; and AOC. 5; and **NB.** Calendars 10; **NB.** GND. 9.

(NS. 4.) TABLE IV.—To Find Easter from Table II. and III.

Day of March, NS., FGND.	Date of Paschal, Full Moon.		Sunday Letters.	Epacts.	Golden Numbers, A. D. 1700, to 1899.	Golden Numbers, A. D. 1900, to 2199.
21	March	21	C	23	14	
22	"	22	D	22	3	14
23	"	23	E	21		3
24	"	24	F	20	11	
25	"	25	G	19		11
26	"	26	A	18	19	
27	"	27	B	17	8	19
28	"	28	C	16		8
29	"	29	D	15	16	
30	"	30	E	14	5	16
31	"	31	F	13		5
32	April	1	G	12	13	
33	"	2	A	11	2	13
34	"	3	B	10		2
35	"	4	C	9	10	
36	"	5	D	8		10
37	"	6	E	7	18	
38	"	7	F	6	7	18
39	"	8	G	5		7
40	"	9	A	4	15	
41	"	10	B	3	4	15
42	"	11	C	2		4
43	"	12	D	1	12	
44	"	13	E	0	1	12
45	"	14	F	29		1
46	"	15	G	28	9	
47	"	16	A	27		9
48	"	17	B	26	17	
	"	17	B	(25)		17
49	"	18	C	25	6	
	"	18	C	24		6
50	"	19	D			
	"	20	E			
	"	21	F			
	"	22	G			
	"	23	A			
	"	24	B			
	"	25	C			

(1) Add one to the year A D., and divide the sum by 19, and the remainder (if any) will be the Golden Number for that year. If there be no remainder, then is 19 the Golden Number.

In Table V., find the Dominical for the year, and in a Leap year, take the Dominical for dates after February 29, as indicated by its being a capital letter.

Then, in Table IV., find the date opposite to the Golden Number, and the date next thereafter which has its Sunday letter the same as the Dominical, is Easter Sunday.

(2) To construct Table IV. Find in Table II. the Index opposite to the beginning of the century in which Table IV. is to be used. Then in Table III. find this same Index under each Golden Number, and opposite to its date, and Sunday letter, and Epact, which transfer from Table III. to Table IV.

(3). Memorized rule to find Easter for all time (NS. 11). (See NS. and AC. 2 to 15, 19, 20, 21, 25; **NB.** NS. 2, 16; 31 to 35; and OS 1 to 3, and AM. 3; and AO. 5, 6; and AOC. **4.**

(NS. 5.) TABLE V.—To Find NS. Dominical.

(1) To find NS. Dominical: Divide the year A D. by 400. Then find the remaining hundreds of years in one of the four right hand columns, and in that column, and opposite to the odd year, find the NS. Dominical for the whole of a common year, or the two Dominicals in a Leap year, of which the capital letter is for dates after February 29, and the small letter for dates before February 29.

Odd Years.				Hundreds of Years.			
				100	200	300	0
0				C	E	G	b. A
1	29	57	85	B	D	F	G
2	30	58	86	A	C	E	F
3	31	59	87	G	B	D	E
4	32	60	88	f. E	a. G	c. B	d. C
5	33	61	89	D	F	A	B
6	34	62	90	C	E	G	A
7	35	63	91	B	D	F	G
8	36	64	92	a. G	c. B	e. D	f. E
9	37	65	93	F	A	C	D
10	38	66	94	E	G	B	C
11	39	67	95	D	F	A	B
12	40	68	96	c. B	e. D	g. F	a. G
13	41	69	97	A	C	E	F
14	42	70	98	G	B	D	E
15	43	71	99	F	A	C	D
16	44	72		e. D	g. F	b. A	c. B
17	45	73		C	E	G	A
18	46	74		B	D	F	G
19	47	75		A	C	E	F
20	48	76		g. F	b. A	d. C	e. D
21	49	77		E	G	B	C
22	50	78		D	F	A	B
23	51	79		C	E	G	A
24	52	80		b. A	d. C	f. E	g. F
25	53	81		G	B	D	E
26	54	82		F	A	C	D
27	55	83		E	G	B	C
28	56	84		d. C	f. E.	a. G	b. A

(2). Memorized rule for NS. Dominical (NS. 10). (See NS. and AC. 4, 5, 7, 10, 11, 13; and OS. 1; and AM. 3, 6.

(NS. 6.) TABLE VI.—To Find Table I. from Tables IV. and V.

Sundays after Epiphany.	Septuagesima Sunday.	Ash Wednesday.	Easter Sunday.	Rogation Sunday.	Ascension Day.	Whit-Sunday.	Trinity Sunday.	Sundays after Trinity.	Advent Sunday.
1	Jan. 18	Feb. 4	Mar. 22	Apr. 26	Apr. 30	May 10	May 17	27	Nov. 29
1	" 19	" 5	" 23	" 27	May 1	" 11	" 18	27	" 30
1	" 20	" 6	" 24	" 28	" 2	" 12	" 19	27	Dec. 1
2	" 21	" 7	" 25	" 29	" 3	" 13	" 20	27	" 2
2	" 22	" 8	" 26	" 30	" 4	" 14	" 21	27	" 3
2	" 23	" 9	" 27	May 1	" 5	" 15	" 22	26	Nov. 27
2	" 24	" 10	" 28	" 2	" 6	" 16	" 23	26	" 28
2	" 25	" 11	" 29	" 3	" 7	" 17	" 24	26	" 29
2	" 26	" 12	" 30	" 4	" 8	" 18	" 25	26	" 30
2	" 27	" 13	" 31	" 5	" 9	" 19	" 26	26	Dec. 1
3	" 28	" 14	Apr. 1	" 6	" 10	" 20	" 27	26	" 2
3	" 29	" 15	" 2	" 7	" 11	" 21	" 28	26	" 3
3	" 30	" 16	" 3	" 8	" 12	" 22	" 29	25	Nov. 27
3	" 31	" 17	" 4	" 9	" 13	" 23	" 30	25	" 28
3	Feb. 1	" 18	" 5	" 10	" 14	" 24	" 31	25	" 29
3	" 2	" 19	" 6	" 11	" 15	" 25	June 1	25	" 30
3	" 3	" 20	" 7	" 12	" 16	" 26	" 2	25	Dec. 1
4	" 4	" 21	" 8	" 13	" 17	" 27	" 3	25	" 2
4	" 5	" 22	" 9	" 14	" 18	" 28	" 4	25	" 3
4	" 6	" 23	" 10	" 15	" 19	" 29	" 5	24	Nov. 27
4	" 7	" 24	" 11	" 16	" 20	" 30	" 6	24	" 28
4	" 8	" 25	" 12	" 17	" 21	" 31	" 7	24	" 29
4	" 9	" 26	" 13	" 18	" 22	June 1	" 8	24	" 30
4	" 10	" 27	" 14	" 19	" 23	" 2	" 9	24	Dec. 1
5	" 11	" 28	" 15	" 20	" 24	" 3	" 10	24	" 2
5	" 12	Mar. 1	" 16	" 21	" 25	" 4	" 11	24	" 3
5	" 13	" 2	" 17	" 22	" 26	" 5	" 12	23	Nov. 27
5	" 14	" 3	" 18	" 23	" 27	" 6	" 13	23	" 28
5	" 15	" 4	" 19	" 24	" 28	" 7	" 14	23	" 29
5	" 16	" 5	" 20	" 25	" 29	" 8	" 15	23	" 30
5	" 17	" 6	" 21	" 26	" 30	" 9	" 16	23	Dec. 1
6	" 18	" 7	" 22	" 27	" 31	" 10	" 17	23	" 2
6	" 19	" 8	" 23	" 28	June 1	" 11	" 18	23	" 3
6	" 20	" 9	" 24	" 29	" 2	" 12	" 19	22	Nov. 27
6	" 21	" 10	" 25	" 30	" 3	" 13	" 20	22	" 28

(2). Find the date of Easter by Table IV. Then, in Table VI., find the same date of Easter, and opposite to that date find all the dates in Table I.; except in a Leap Year, add one day to dates before March 1, and take the number of Sundays after Epiphany, as if Easter fell one day later than its actual date.

(3). Memorized rules for those dates (NS. 11, 25). (See NS. and AC. 1 to 7; 9 to 15, 23, 25; and OS. 2, 5; and AM. 3, 4, 5; and AO. 5; and AOC. 4; and **NB.** NS.

(NS. 7.) TABLE VII.—To Find the Dates in Table I., from Table IV. and V.

Dominical.	Table of Epacts.	Sundays after Epiphany.	Septuagesima Sunday.	Ash Wednesday.	Easter Sunday.	Ascension Day.	Whit Sunday.	Sundays after Trinity.	Advent Sunday.
	23	1	Jan. 18	Feb. 4	Mar. 22	Apr. 30	May 10	27	Nov. 29
	22, 21, 20, 19, 18, 17, 16	2	“ 25	“ 11	“ 29	May 7	“ 17	26	“
D	15, 14, 13, 12, 11, 10, 9	3	Feb. 1	“ 18	Apr. 5	“ 14	“ 24	25	“
	8, 7, 6, 5, 4, 3, 2	4	“ 8	“ 25	“ 12	“ 21	“ 31	24	“
	1, 0, 29, 28, 27, 26, (25) 25, 24	5	“ 15	Mar. 4	“ 19	“ 28	June 7	23	“
	23, 22	1	Jan. 19	Feb. 5	Mar. 23	May 1	May 11	27	Nov. 30
	21, 20, 19, 18, 17, 16, 15	2	“ 26	“ 12	“ 30	“ 8	“ 18	26	“
E	14, 13, 12, 11, 10, 9, 8	3	Feb. 2	“ 19	Apr. 6	“ 15	“ 25	25	“
	7, 6, 5, 4, 3, 2, 1	4	“ 9	“ 26	“ 13	“ 22	June 1	24	“
	0, 29, 28, 27, 26 (25), 25, 24	5	“ 16	Mar. 5	“ 20	“ 29	“ 8	23	“
	23, 22, 21	1	Jan. 20	Feb. 6	Mar. 24	May 2	May 12	27	Dec. 1
	20, 19, 18, 17, 16, 15, 14	2	“ 27	“ 13	“ 31	“ 9	“ 19	26	“
F	13, 12, 11, 10, 9, 8, 7	3	Feb. 3	“ 20	Apr. 7	“ 16	“ 26	25	“
	6, 5, 4, 3, 2, 1, 0	4	“ 10	“ 27	“ 14	“ 23	June 2	24	“
	29, 28, 27, 26 (25), 25, 24	5	“ 17	Mar. 6	“ 21	“ 30	“ 9	23	“
	23, 22, 21, 20	2	Jan. 21	Feb. 7	Mar. 25	May 3	May 13	27	Dec. 2
	19, 18, 17, 16, 15, 14, 13	3	“ 28	“ 14	Apr. 1	“ 10	“ 20	26	“
G	12, 11, 10, 9, 8, 7, 6	4	Feb. 4	“ 21	“ 8	“ 17	“ 27	25	“
	5, 4, 3, 2, 1, 0, 29	5	“ 11	“ 28	“ 15	“ 24	June 3	24	“
	28, 27, 26 (25), 25, 24	6	“ 18	Mar. 7	“ 22	“ 31	“ 10	23	“
	23, 22, 21, 20, 19	2	Jan. 22	Feb. 8	Mar. 26	May 4	May 14	27	Dec. 3
	18, 17, 16, 15, 14, 13, 12	3	“ 29	“ 15	Apr. 2	“ 11	“ 21	26	“
A	11, 10, 9, 8, 7, 6, 5	4	Feb. 5	“ 22	“ 9	“ 18	“ 28	25	“
	4, 3, 2, 1, 0, 29, 28	5	“ 12	Mar. 1	“ 16	“ 25	June 4	24	“
	27, 26 (25), 25, 24	6	“ 19	“ 8	“ 23	June 1	“ 11	23	“
	23, 22, 21, 20, 19, 18	2	Jan. 23	Feb. 9	Mar. 27	May 5	May 15	26	Nov. 27
	17, 16, 15, 14, 13, 12, 11	3	“ 30	“ 16	Apr. 3	“ 12	“ 22	25	“
B	10, 9, 8, 7, 6, 5, 4	4	Feb. 6	“ 23	“ 10	“ 19	“ 29	24	“
	3, 2, 1, 0, 29, 28, 27	5	“ 13	Mar. 2	“ 17	“ 26	June 5	23	“
	26 (25), 25, 24	6	“ 20	“ 9	“ 24	June 2	“ 12	22	“
	23, 22, 21, 20, 19, 18, 17	2	Jan. 24	Feb. 10	Mar. 28	May 6	May 16	26	Nov. 28
	16, 15, 14, 13, 12, 11, 10	3	“ 31	“ 17	Apr. 4	“ 13	“ 23	25	“
C	9, 8, 7, 6, 5, 4, 3	4	Feb. 7	“ 24	“ 11	“ 20	“ 30	24	“
	2, 1, 0, 29, 28, 27, 26 (25)	5	“ 14	Mar. 3	“ 18	“ 27	June 6	23	“
	25, 24	6	“ 21	“ 10	“ 25	June 3	“ 13	22	“

NOTE.—Trinity Sunday is seven days after Whit-Sunday.
“ Rogation Sunday is four days before Ascension.

(2). In Table IV. find the Epact opposite to the Golden Number of the year. In Table V. find the Dominical for the whole of a common year, or for dates after February 29 in a Leap Year, as indicated by its being a capital letter. Then in Table VII. find the Epact concurring with the Dominical, and on the same line as the Epact, find the dates in Table I.; except in a Leap Year, add one day to all dates before March 1, and take the number of Sundays after Epiphany as if Easter fell one day later than its actual date.

(3). Memorized rules to find these dates (NS. 11, 25). (See NS. and AC. 1 to 7, 9 to 15, 23, 25; **NB.** NS.; and OS. 2, 5; and AM. 3, 4, 5; and AO. 5; and AOC. 4.)

NS.

Memorized and verbal rules, with examples in common almanacs (NS. 8 to 29), Explanations (NB. NS.), Contradictions (NB. NS., 31 to 35), (NB. Authors).

8. CIRCLE (A. Circle).

9. CYCLE. For the year JP. add 4713 to the year AD. Then divide the year JP. by the Circle 19 for GN., or by the Circle 28 for Solar Cycle, or by the Circle 15 for Indiction, and the remainder is the year of the Cycle.

10. DOMINICAL. (1.) Remember the date of the first Sunday in the year, and that date, Jan. 1 to 7, gives the Dominical A. to G. for the whole of a common year ; or before Feb. 29 in a leap year, as marked in small letters (NS. 5, 10–4th). Then the next earlier letter is for dates after Feb. 29, counting G. as next before A., as marked with large letters in (NS. 5; 10—4).

Thus A D. 1874, Sunday, Jan. 4 = D. for NS. Dominical. And every date which has its Sunday letter the same as the Dominical NS. or OS. or AC., is Sunday dated NS. or OS. or AC., according to the Dominical (NS. and AC., 1, 4, 5, 7, 10, 11, 13, 29).

(2.) For all time after (NS. 18).

Divide the centuries by 4, and twice what does remain
Take from 6, and to the number you gain
Add the odd years and their fourth, which dividing by 7,
What is left take from 7, and the letter is given.

And 1 to 7 = A to G for dates after Feb. 29 in a leap year, as given in capital letters (NS. 5, 10–4th, 23).

(3.) Or, to the number found for OS. Dominical by (OS. 1), add NS. SC. for NS. Dominical, or add AC. SC. for AC. Dominical, and divide the sum by the circle 7, and the remainder 1 to 7 will be A to G for dates after Feb. 29 in a leap year (NS. and AC. 8, 27).

(4.) Or, from A D. 1700 to March 1, A D. 1900, find the year of the Solar Cycle (NS. 9). Then find the same number in the following NS. Solar Cycle, and opposite to that number find N S. Dominical, with small letters for dates before Feb. 29 in a leap year.

1	e.	D	5	g.	F	9	b.	A	13	d.	C	17	f.	E	21	a.	G	25	c.	B
2		C	6		E	10		G	14		B	18		D	22		F	26		A
3		B	7		D	11		F	15		A	19		C	23		E	27		G
4		A	8		C	12		E	16		G	20		B	24		D	28		F

(5.) Or, for all time after (NS. 18), to memorize this table and its modifications, add one day to NS. SC. (NS. 27), and divide the sum by the circle 7 (NS. 8), and the remainder 1 to 7 = A to G for the year 28. Then, as above, write down the Dominicals in the reverse order of the dates, doubling the letters in the leap years 25, 21, 17, 13, 9, 5, 1. Thus 1 + 12, NS. SC. = 13 ;÷7, leaves 6 = F for year 28 in the table above. Do the same with AC. SC. for Dominical AC.

11. EASTER. Find NS. FGND. and NS. Ferial for that date. The Sunday next thereafter is NS. Easter (NS. 1, 4, 7, 9, 11, 13, 14, 15). For OS. Easter, see (AM. 1 to 7 ; OS. 1 to 5).

NS.

12. EPACT, for the year. Multiply GN. by 11, and add the product to the Key epact, and divide the sum by 30 and the remainder = NS. Epact (NS. 1, 3, 4, 9, 12, 14, 15, 21).

13. FERIAL, or day of the week. (1.) Find the Sunday letter for the 1,8, 15, 22, 29 of each of the twelve months, the same as the initial letter of the following 12 words:

At, Dover, Dwells, George, Brown, Esquire,
Good, Christian, Fitch, And, David, Friar.

Then find the Dominical (NS. or OS. or AC). Then count the Sunday letters forward from the Dominical as Sunday, to the Sunday letter as found for the 1, 8, 15, 22, 29th of the month, and thus find the Ferial for these dates, and thence any intermediate ferial dated OS. or NS. or AC., according to the Dominical (NS. and AC., 1, 4, 7, 10, 11, 13,) (OS. 3 ; AM. 6).

(2.) Examples (AM. 7) for OS. Ferials and (NS. 1) for NS. Ferials. Also: Find the Dominical (NS. or OS., or AC.) Then, in the following table, find at the head of one of the columns, the Sunday Letter the same as the Dominical, and under that letter find the date of every Sunday in a common year, or in that part of a Leap Year which corresponds with the Dominical, and dated NS. or OS., or AC., according to the Dominical.

Also, in this table, find the Sunday Letter for each day in the year, excepting Feb. 29, which has no letter.

Also find the Sunday Letters for the 1, 8, 15, 22, and 29th of each of the twelve months (NS. 13–1).

Months.	Sunday Letters.						
	A	B	C	D	E	F	G
January	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
October	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31				
				1	2	3	4
February	5	6	7	8	9	10	11
March	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
November	26	27	28	29	30	31	
							1
April	2	3	4	5	6	7	8
July	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
	30	31					

Months.	Sunday Letters.						
	A	B	C	D	E	F	G
			1	2	3	4	5
August	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30	31		
						1	2
	3	4	5	6	7	8	9
September	10	11	12	13	14	15	16
December	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
	31						
		1	2	3	4	5	6
	7	8	9	10	11	12	13
May	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30	31			
					1	2	3
June	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	

14. FGND = *Full Moon* = 14th Nisan from AD. 1700 to 1899. (1.) Multiply GN. by 11; divide the product by 30; subtract the remainder from the Key date (March 55 until AD. 1900), and the second remainder is the date of NS. Full moon by scale, if on or between March 21 and 50. If not, then add or subtract 30 days to bring it there.

(2.) Or, subtract the NS. Epact from January 103 or March 44, and the remainder is the date by scale, if on or between March 21 and 50. If not, then add or subtract 30 days to bring it there, (as from AD. 1700 to 1899.)

(3.) For all time after (NS. 18), find the date as above. Then, if any date thus fall on March 50, retract it to March 49 (April 18), and if the date of any GN. from GN. 12 to 19 thus fall on March 49, retract it to March 48 (April 17). And in all cases, if the date exceed March 31, subtract 31, and call the remainder April. (NS. 4, 7, 11, 14.)

(4.) Examples. Every date in (NS. 3, 4), and in (AC. 3, 4 when NS. 14—3 is omitted).

15. GN. = Golden Number (NS. and AC. 3, 4, 9, 15; NB. GND. ;) (AM. 2; OS. 2).

16. INDEX. (1.) This is memorized in combination (NS. 20, 21).

(2.) For all time after (NS. 18). To the constant 24 add NS. SC.; from the sum subtract NS. LC.; divide the remainder by 30, and the second remainder = NS. Index (NS. 2, 22, 27; AC. 16.)

(3.) To tabulate NS. 2, count Index = 0 in AD. 1582 or 1600, then add one day for each centurial year that is not marked "B" (for Leap Year), and from the sum subtract one day in each centurial year when NS. LC. increases one day, until the result be 30 days or more. Then subtract 30 days.

17. INDICTION. (NB. Indiction.)

18. INTRODUCTION. Count all recorded dates as OS. (AM. 3, OS. 3, 4), until the introduction of NS., when 10 days NS. SC. were added to Oct. 5, making Oct. 5–15, AD. 1582, in Rome, Spain, Portugal; Dec. 10–20, AD. 1582, in Brabant, Flanders, Hainault; Dec. 15–25, AD. 1583, in France; AD. 1585, in the Romish provinces of Germany; AD. 1586 in Poland; AD. 1587 in Hungary; Sept. 4–15, AD. 1752, in England and colonies; AD. 1778 in Prussia. (See Brady, pp. 28, 29; Jarvis, pp. 95, 96; Long, § 1244; Adams, pp. 354–5; Wheatly, 37–8; Renwick-Calendar; Rees-Calendar.)

19. JP. To find the year JP. (Julian Period) add 4713 to the year AD., or subtract the year BC. from 4714 (NB. JP.)

20. KEY DATE = March 55 from AD. 1800, March 1; to AD. 1900, March 1. (NS. and AC. 14; OS. 2).

(2). For all time. To March 54 add the NS. Index for the century and the sum = Key date. Examples as for (NS. and AC. 14); (NS. and AC. 16.)

If more convenient, subtract 30 days. Thus AD. 8200 to AD. 8399. Key date March 83–30 = March 53.

(3.) Or, multiply any GN by 11, divide the product by 30; add the remainder to GND and the sum = key date for the whole series, if by scale.

21. KEY EPACT (1.) = 19 from AD. 1700, March 1, to AD. 1900, March 1.

(2.) For all time, subtract the NS. index from 20 (increased by 30 if required), and the remainder = Key epact. (Examples as for NS. 14) (NS. and AC. 16.)

22. LC. = Lunar Correction. (1.) Memorize in combination (NS. 14, 16, 20, 21).

(2.) For all time; count 4 days in AD. 1582, and thereafter subtract 18 from the

centuries AD.; divide the remainder by 25 for the first quotient; divide the second remainder by 3 for the second quotient so that it be not more than 7. Then multiply the first quotient by 8, and to the product add the second quotient and the constant 5, and the sum = NS. LC.

(2). Or begin with 5 days in AD. 1800 and add one for each 300 years seven times, and then in 400 years once, making 8 days in 2500 years, and repeat (NS and AC. 2, 16).

23. LEAP YEAR. (1.) Divide by 4 the odd years, omitting the centuries, and if there be no remainder, the year is a leap year (NS., OS. and AC.) Divide by 4 the centuries, omitting the odd years, and if there be no remainder, the centurial year is NS. Leap Year marked B in (NS. 2). All other years are common years by NS. But all centurial years are leap years by OS. And this difference = NS. SC. (NS. 27.)

24. MARCH 21 is the assumed date of the Vernal equinox by "Paschal Canon." It was its artificial maximum Julian date in AD. 325, when its Calendar or actual date was March 20. Contra (NB. NC.)

25. MOVEABLE FEASTS, by memory. Find the Dominical and the date of Easter. Then,

Advent Sunday is Nov. 27, Sunday Letter B, when the Dominical is B, to Dec. 3 = letter A when Dominical is A. Then:

Septuagesima	Sunday is	nine	weeks before Easter.
Sexagesima		eight	
Quinquagesima		seven	
Quadragesima		six	
Rogation Sunday	is	five weeks	after Easter.
Ascension Day		40 (39) days	
Whit Sunday		7 weeks	
Trinity Sunday		8 weeks	

26. RETRACTIONS, memorized (NS. 14–3d). Examples (NS. 3, 4, 14, 26), (NB. NS. 3,14; NB. AC. 3,26.)

27. SC. = For NS. Solar Correction (1) remember 12 days, from March 1, AD. 1700, to March 1, AD. 1900, which add to dates OS. to find dates NS.; and subtract from dates NS. to find dates OS. (2.) Also memorize in combination (NS. 16, 20, 21).

(3.) For all time after (NS. 18). Subtract 12 from the centuries AD.; divide the remainder by 4 for quotient and second remainder. Then multiply the quotient by 3, and to the product add the second remainder and the constant 7, and the sum = NS. SC.

(4.) Or, begin with 10 at AD. 1500, and add one day for each centurial year that is not NS. Leap Year (NS. and AC. 2, 16, 23). (NB. AC. 2—2.)

28. SCALE. (NB. Scale).

29. SUNDAY LETTERS. (NS. 3, 4, 13).

30. TABLES. (NS. 1 to 7).

NS. NOTES.

1 to **7**. These are transferred to (NS. 2—3d).

CONSTRUCTION OF TABLES II. AND III.

2, 16. For Table II., set down in tabular form the quantities found by (NS. 16).

3, 14—1, 2. For Table III., prepare a blank table, with the upper line of NS. GN., and a lower line of corresponding AM. GN., and with dates and Sunday letters carried down regularly to April 19, as in (AC., Table III). Then add 13 days to the Epacts for the Paschal new moon, as found in the Missal down to April 17th, and continue, as in AC., Table III., April 18 = C = 25, April 19 = D = 24.

Then assume that GN. 3 falls on March 21, as the earliest limit (NS. 24), and from this standard—GN. 3 = March 21—measure off by scale (NS. 28) the dates of all the other GN. in the series. Then, under each GN. and opposite to its date thus found place the same index "0." Then, in each column, set down the indexes 1 to 29 in the circle of 30 days on or between March 21 and April 19, beginning next after, and ending next before the index "0." This completes Table III., in accordance with the memorized rule (NS. 14—1st, 2d) and (AC. 3, 26).

14—3. Then retract all the indexes which by scale fall on April 19 to second April 18, and carry with them their Epact 24; thus doubling it with 25 at April 18. Then retract the indexes of all GN. from GN. 12 to 19, from April 18 to second April 17, and carry with them their epact (25), marked extra to show that it only belongs to GN. 12 to 19, and thus double 26 regular with (25) extra. This completes Table III., in accordance with (NS. 2, 3, 4, 7, 14).

EXPLANATION OF TABLE II.

2, 16. In Table II., the index 0 to 29, is the number of days after March 21 (NS. 24) on which falls the standard full moon for the 14th Nisan in the year GN. 3. It assumes that, in A D. 325 = GN. 3 = the year of the Council of Nicea, this moon fell 24 days after March 21, and, calculating in Julian years of 365.25 days, this moon, returning in each 19 years, had receded 4 days in A D. 1582 and 5 days in A D. 1800, and will continue to recede one day in 300 years seven times, and then in 400 years once; making 8 days in 2500 years = 0.32 day per century = NS. LC. (NS. 22).

But a mean year of 365.242,216 days is actually 0.007,784 days shorter than a Julian year of 365.25 days.

The index assumes that it is 0.007,500 days shorter, and hence March 21 in Julian time or (OS.) had advanced towards the summer solstice 10 days in A D. 1582, or, in other words, the mean date of the vernal equinox, counted in Julian years, had receded 10 days in A D. 1582, and 11 days in A D. 1700, and will continue to recede 3 days in 4 centuries = 0.75 day per century = NC. SC. (NS. 2, 24, 27; AC. 2, 24, 27).

Hence, while in terms of OS. the moon recedes at the rate of 0.32 day per century, the vernal equinox recedes at the rate of 0.75 day per century, and thus the moon recedes 0.43 day per century less than the equinox; and, assuming that NS. SC. will keep March 21, NS., up to the actual date of the vernal equinox, the moon GN. 3 will advance towards the summer solstice at the rate of 0.43 day per century.

This caused the moon GN. 3 to advance from 24 days after March 21 in A D. 325 (= constant 24 in NS. 16) to 30 days in A D. 1582 in equinoxial time, when the

moon 30 days earlier in the same standard year fell at the index "0" days after March 21, NS., and this second moon became the standard for the second and present Great Cycle beginning in A D. 1582 and ending A D. 8500, when, in like manner, the moon 30 days earlier in the same year GN. 3 will become the standard for the next and third Great Cycle.

This moon, advancing at the rate of 0.43 day per century, makes the average Great Cycle 6977 years in which to advance 30 days (= 30÷0.0043). But NS. LC. and NS. SC. being in whole days, and NS. LC. only applied at the end of 3 and 4 centuries, the present Great Cycle extends from A D. 1582 to A.D. 8500 = 6918 years (NB. AC.; NB. Calendars).

EXPLANATION OF TABLE III.

3, 14. This Table III. is given in full in the memorized rules (NS. 14), excepting the Greek GN. To memorize Table III. with Greek GN., add 3 in a circle of 19 to convert GN. AM. into GN. J.P., and then proceed as in NS. (AM. 2, 4; NS. 8, 9; NB. scale 7.)

This Table III. is a collection of Scales to measure the dates of the whole series from the varying dates of the standard GN. 3. Before the retractions (NS. 14—3d), the mass of figures under the 19 GN. show, that, for every day that GN. 3 advances, each other GN. must advance one day in the circle of 30 days on and between March 21 and April 19, in order to preserve the Scale unbroken, until GN. 3 has run its course of 30 days after March 21, and a new GN. 3 takes its place at 0 days after March 21, when all GN. fall on the same dates as at the beginning of the previous or of any other great cycle. And each GN. takes its moon 30 days earlier in the same year GN., when its index passes from April 19 to March 21.

The retractions from Apr l 19 to second April 18 keep the dates within the "Paschal limits = March 21 and April 18." This forces back GN. 12 to 19 when GN. 1 to 8 are retracted, to prevent two moons in the same series falling on the same date, because, by scale, GN. 1 to 8 fall on the day next after GN. 12 to 19, without a vacant date between them. This necessarily occurs when GN. 12 to 19 fall on April 18. Hence (NS. 14—3d.) (NB. AC.)

(NB. Authors.) Jarvis (pp. 95, 96, 105–110); Long (1244–1273); Brady (28–29); Adams (354–355); Wheatly (34–37); Renwick (calendar); Rees (calendar, cycle number); Monravieff (Vol. 1, pp. 355–6); Montucla (Vol. 1, p. 582); Delambre (Vol. 1, p. 12) says "I found the calendar better than its authors supposed." Long (1267) says that Clavius explains the system and defends it from the attacks of Mœstlinus, Vieta and Scaliger. The Missal (*De festibus Mobilibus*) says: "*De qua re plura invenies in libro novæ rationis restituendi Kalendarii Romani.*" Barnard; Gauss; Blunt; Neale. (AC. Notes 131, 132.)

CONTRADICTIONS.

31. Seabury (NB. Authors) desires the Anglicans to "re-cast" their calendar and adopt the Roman mode (pp. xiv., x., xi., 117, 118, 206, 207).

For this purpose he makes remarks on the following pages, which are placed among the Contras.

On pp. 206, 7, 118, 211, he calls NS. Tables II. and III. "a wilderness of figures;" while, without the present addition of Epacts, they form a better condensation of the entire system of NS. than can be found elsewhere.

32. On pp. 197, xii., xiii., 124, 126, 131, 134, 152, 194, 198, he advocates "the symple and immutable system of Epacts," while the immutable Epacts are like Sunday let

ters, and the Epacts which determine Easter are like Dominicals, and are derived from the GN. that are used by the Anglicans and change simultaneously 30 times during each Great Cycle.; and of these changes the Missal gives but one, while the Anglican Table III. gives them for all time (NB. NS. 2; NB. GND. 8.)

33. On pp. 78, 67, 71, 72, 90, he says: "The Alexandrian Canon was founded on the Cycle of Meto (reduced from 6940 to 6939 days, 18 hours)," and "drawn off with difficulty from the use of the Jewish Cycle of 84 years." Now, the Alexandrian Canon or Nicean Cycle of the century after A D. 325 (NC.), and the Metonic Cycle of BC. 432 (OE.), and the present Jewish Cycle of A D. 360 (AO.) are fundamentally different. Neither is a copy of the other. Neither can be modified into the other. The characteristic of the Nicean Cycle (NC. NGND. in NB. GND.) is the scale which counts 18 years of 365 days and one year of 366 days, making 6936 days. This always counts in Julian time, and is thereby expanded to 6939.75 days; and it counts by whole days, and makes no difierence between a common year and a leap year; and begins the day at all hours of the natural day (NB. NC. Contra). The Metonic Cycle (OE.) also counts by whole days; but, when reduced to terms of JP. it counts 365 days in a common year and 366 days in a leap year, and begins the day invariably at midnight at Athens. The present Jewish Cycle (AO.) measures 19 lunar years of 6 different lengths by 235 lunations, which vary from the latest determination only 5¾ seconds per year, and counts invariably from 6 hours after noon at Jerusalem (or at Eden, says Muler), and, when reduced to Christian dates, makes a common year 365 and a leap year 366 days.

34. On pp. 123, 194, xiv., 89, 189, 200, 211, he condemns the "Hanoverian method" of finding lunar dates by means of Golden Numbers. But this was begun by Meton and Euctemon about 2300 years back (OE.); (unless they borrowed it from the Egyptians or from the Babylonians, as may be suspected from their determination of the date of new moon and of the Summer Solstice in terms of NE.) This has been used by all Christians since A D. 534. It is now used by the Greek Church (AM.) It is now used by the Roman Church in the modified form of Epacts. (NS.12.)

35. On p. 193, he says: "The Paschal Feast . . . was wrested from its connection and made to stand alone; as if the Church, wearied of God's own ordinance for the regulation of her annual solemnities, would choose some strange light, which should shine like the Dog star but for one month in the year" [*sic*]. Now the Dog star shines about eleven months, until overpowered by the light of the sun. And this change was made by Dionysius Exiguus, A D. 525 (Seabury, p. 78), and confirmed by the Council of Chalcedon, A D. 534, and from that day to the present the Paschal month alone has been used to find the date of Easter by all Christians without exception (AM.; OS.; NS. 4; NS. 7). But, since the introduction of the Roman Cycle of BC. 45 (AU. GN), a variety of cycles of 235 moons have been constructed, following the receding dates of the moon in terms of OS., followed by the equivalent Cycle of Epacts in the Roman Missal; to answer imperfectly the purpose of a modern almanac (NB. GND.) And such are now cut on walking sticks and used in the north of Europe, under the name of Clogs, Reinstocks, Rumstaffs, Runstocks, Primsteries, Scipiones, Runici, Baculi, Annales, Staves, Stakes (Brady, p. 47; Hones Preface: Rees—Runic Staff), and a comparison shows that one at least is the original NC. GN. (NB. GND). (See NB. Calendars 18—11, 12.)

OE.

OE.=OLYMPIC ERA.

Preface.

Petavius calls the first Olympiad : "The torch-light of ancient history." And Jarvis says : "From the first Olympiad of Iphitus only, does profane history derive its definite form, and detach itself entirely from traditional conjecture." Hence the importance of rules to give dates precisely, as counted by the ancient Greeks, for the use of historians and astronomers. (NE. Notes 19–36.)

Such rules have not been found elsewhere. But many detached statements by ancient authors furnish sufficient data for the present rules, to give dates precisely as counted by the Greeks, during the Metonic and Calippic periods, as proved by the numerous examples of eclipses and of new and full moon.

The first Metonic Cycle was almost precisely astronomic. The Iphitan rules transfer this cycle backwards over the previous period. We know that Iphitan dates were not thus found. But we know that such was the intention, and that the cycles were frequently changed to produce these results, as subsequently the Metonic was changed to the Calippic when the Metonic erred one day. Hence the inference that the Iphitan rules give dates precisely as counted by the Greeks on the introduction of each new cycle, and that the dates were never allowed to vary much from what were desired.

Also, in early times the Greeks had a system of dates counting backwards from conjunction. Hence the inference, that at that time dates were strictly astronomic, as we know was the case with ancient Hebrews, and with many Mohammedans, up to the present time. If this inference be correct, then the Iphitan rules give dates precisely as counted by the Greeks at that time.

Explanatory Notes.

Olympic Era. (1, 28, 35–38, 65.)
Iphitan Era. (2, 23–28, 35–37, 47–54, 65.)
Metonic Era. (3, 5–16, 21, 25, 26, 29, 30, 35, 41–45, 49, 60–62.)
Calippic Era. (4, 22, 25, 26, 30–34, 40, 46, 61, 62, 65.)
Metonic Table. (5–16, 20–26, 29, 30, 35, 36, 41–45, 59, 60.)
Astronomic Accuracy. (9–14, 30–32, 42, 55–57.)
Historic Data. (2, 15, 16, 29, 32, 47–54, 62.)
Rules Explained. (17–25.)
OE. dates are in terms of DJP. (21, 45.)
First year of Meton's Cycle called GN. 7. (21, 36, 59, 60.)
Calippic dates average the same in OS. for all time. (22, 46, 65, 66.)
Iphitan Corrections to Metonic dates. (23, 24, 35–37, 47–54, 65, 66.)
Examples prove the rules to be correct. (37–40.)

Contradictions by

Scaliger, De Emendatione Temporum (41–47). Dodwell, De Veteribus Græcorum, Romanorumque Cyclis (48–57). Petavius' Uranologion, in which he translates the Greek of Geminus into Latin (58). Jarvis' Chronological History of the Church (58). Numbering the years in the cycle (59, 60). Rees' Cyclopedia (61 62). Long's Astronomy (63, 64). American Nautical Almanac (65, 66).

OE.=OLYMPIC ERA=OLYMPIADS.—Metonic Table of GND.

JCC.	Bissextiles.	Table of New Moons at Metonic New Year in terms of JP. Cal. at Athens.	Golden Numbers.	E.=Embolismic.	Hekatombaion.	Metagitnion.	Boedromion.	Maimakterion.	Pyanepsion.	Anthesterion.	Posidion.	Gemerion.	Elaphebolion.	Munichion.	Thargetion.	Skirrophorion.	Embolismic.
					1	2	3	4	5	6	7	8	9	10	11	12	13
.25		4282 July 15.958	7		0	30	60	89	119	148	178	207	237	266	296	325	
.50		4283 " 5.324	8	E	355	384	414	443	473	503	532	562	591	621	650	680	709
.75		4284 " 24.223	9		739	768	798	827	857	886	916	945	975	1005	1034	1064	
0	B	4285 " 12.590	10		1093	1123	1152	1182	1211	1241	1270	1300	1329	1359	1388	1418	
.25		4286 " 1.957	11	E	1448	1477	1507	1536	1566	1595	1625	1654	1684	1713	1743	1772	1802
.50		4287 " 20.854	12		1831	1861	1890	1920	1950	1979	2009	2038	2068	2097	2127	2156	
.75		4288 " 10.221	13		2186	2215	2245	2274	2304	2333	2363	2393	2422	2452	2481	2511	
0	B	4289 June 28.589	14	E	2540	2570	2599	2629	2658	2688	2717	2747	2776	2806	2835	2865	2895
.25		4290 July 17.486	15		2924	2954	2983	3013	3042	3072	3101	3131	3160	3190	3219	3249	
.50		4291 " 6.853	16	E	3278	3308	3333	3367	3397	3426	3456	3485	3515	3544	3574	3603	3633
.75		4292 " 25.751	17		3662	3692	3721	3751	3780	3810	3840	3869	3899	3928	3958	3987	
0	B	4293 " 14.118	18		4017	4046	4076	4105	4135	4164	4194	4223	4253	4283	4312	4342	
.25		4294 " 3.485	19	E	4371	4401	4430	4460	4489	4519	4548	4578	4607	4637	4666	4696	4725
.50		4295 " 22.383	1		4755	4785	4814	4844	4873	4903	4932	4962	4991	5021	5050	5080	
.75		4296 " 11.750	2		5109	5139	5168	5193	5228	5257	5287	5316	5346	5375	5405	5434	
0	B	4297 June 30.117	3	E	5464	5493	5523	5552	5582	5611	5641	5670	5700	5730	5759	5789	5818
.25		4298 July 19.015	4		5848	5877	5907	5936	5966	5995	6025	6054	6084	6113	6143	6173	
.50		4299 " 8.382	5	E	6202	6232	6261	6291	6320	6350	6379	6409	6438	6468	6497	6527	6556
.75		4300 " 27.279	6		6586	6615	6645	6675	6704	6734	6763	6793	6822	6852	6881	6911	
0	B	4301 " 15.646	7		6940												

OE.

OE. Rule 1. *Greek days of the month.*

1.	Neomenia, or Noumenia=New moon.		
1.	Proté Archomenou, or Proté Istamenou.		
2.	Deuteré	"	"
3.	Trité	"	"
4.	Tetarté	"	"
5.	Pempté	"	"
6.	Hekté	"	"
7.	Hebdomé	"	"
8.	Oktoé	"	"
9.	Enneaté	"	"
10.	Dekaté	"	"

11.	Proté Epideka, or Proté Mesountos.		
12.	Deuteré	"	"
13.	Trité	"	"
14.	Tetarté	"	"
15.	Pempté	"	"
15.	=Dichomenia=Middle moon=Full moon.		
16.	Hekté Epideka, or Hekté Mesountos.		
17.	Hebdomé	"	"
18.	Oktoé	"	"
19.	Enneaté	"	"
20.	Eikas=Twentieth.		

21.	Proté Epeikadi, or Phthinontos Dekaté.			
22.	Deuteré	"	"	Enneaté.
23.	Trité	"	"	Oktoé.
24.	Tetarté	"	"	Hebdomé.
25.	Pempté	"	"	Hekté.
26.	Hekté	"	"	Pempté.
27.	Hebdomé	"	"	Tetarté.
28.	Oktoé	"	"	Trité.
29.	Enneaté	"	"	Deuteré.
30.	Triakas=Thirtieth		"	Proté.

OE. Rule 2. For Olympic lunar dates add 0.400 to standard date found by MDB. But for solar dates add 0.036,293 for the longitude of Athens.

JP. into Metonic.

OE. Rule 3. Reduce the given date to DJP., from which subtract 1,431,970, and divide R by 6940 for R=GND., from which subtract the GND. in the Metonic Table for R=day of the month which is above, in the year GN. which is opposite to that GND. Then divide the given year JP. by the circle 19 for R=GN. JP. And if this be the same as GN. found, subtract 3933 from the given year JP., but if not the same, subtract 3934, and divide R by the circle 4, for Q=Olympiads and R=the odd year.

JP. into Calippic.

OE. Rule 4. Subtract 4282 from the given year JP. and divide R by 76 for Q (neglecting fractions)=Calippic correction on and after JP. 4384 June 29. Then add this correction to DJP. and proceed by OE. Rule 3.

JP. into Iphitan.

OE. Rule 5. Subtract the given year JP. from 4301 and divide R by 19 for Q (neglecting fractions), which multiply by 0.311,585 for P (including fractions)= Iphitan correction, which subtract from the given date for the whole number of the day, while retaining the original fraction. Then substitute this corrected DJP. for the DJP. of Rule 3, and proceed by OE. Rule 3.

Except in GN. OE. 14 before JP. 4207, count the month one less than found by rule.

Metonic into JP.

OE. Rule 6. Multiply the Olympiad by 4, and to P add the odd year, and divide S by the circle 19, for Q of cycles+R=GN. Then opposite to that GN. in the Metonic Table, and under the name or number of the given month find the GND., to which add the given day of the given month, and the constant 1,431,970, and the product of Q multiplied by 6940, and S=DJP.

But to find the year OE. subtract *one* from the Olympiad, and multiply R by 4 and to P add the odd year.

Calippic into JP.

OE. Rule 7. Find the Metonic date by Rule 6, and then subtract the Calippic correction as found by Rule 4.

Iphitan into JP.

OE. Rule 8. Find the Metonic date by Rule 6, and then add the Iphitan correc tion as found by Rule 5.

Except in GN. OE. 14 before JP. 4027, take the GND. in the Metonic Table for one month later than the given month.

OE. EXAMPLES.

Iphitan Era began JP. 3938 *July* 9.

GN. JP.							Cor.	GN. OE.
5	New Moon...	JP. 3938 July 9.302	OE. 1	y. 1	m. 1	d. 1.302	−5.9	5
14	New Moon...	JP. 3947 July 29.728	3	2	1	1.728	−5.6	14
3	Eclipse Lunar	JP. 3993 Mar. 19.745	14	3	9	15.745		2

Metonic Era began JP. 4282 *July* 15.

GN. JP.							Cor.	GN. OE.
7	New Moon...	JP. 4282 July 15.958	OE. 87	y. 1	m. 1	d. 1.958	0	7
8	Eclipse Solar.	JP. 4283 Aug. 3.856	87	2	2	1.856	0	8
5	New Moon...	JP. 4299 July 8.382	91	2	1	1.382	0	5
7	Eclipse Lunar	JP. 4301 Aug. 28.942	91	4	2	15.942	0	7
14	Eclipse Lunar	JP. 4308 Apr. 16.450	93	2	10	15.450	0	13
18	Eclipse Lunar	JP. 4331 Dec. 23.913	99	2	6	15.913	0	18
19	Eclipse Lunar	JP. 4332 June 19.097	99	2	12	15.097	0	18
19	Eclipse Lunar	JP. 4332 Dec. 13.280	99	3	6	15.280	0	19
14	New Moon...	JP. 4384 June 29.031	112	2	12	29.031	0	13

Calippic Era began JP. 4384 *June* 29.

GN. JP.							Cor.	GN. OE.
14	New Moon...	JP. 4384 June 29.031	OE. 112	y. 3	m. 1	d. 1.031	+1	14
10	Eclipse Lunar	JP. 4513 Sept. 23.677	144	4	3	15.677	+3	10
11	Eclipse Lunar	JP. 4514 Mar. 19.861	144	4	9	15.861	+3	10
11	Eclipse Lunar	JP. 4514 Sept. 13.044	145	1	3	15.044	+3	11
18	Eclipse Lunar	JP. 4540 May 1.241	151	2	10	15.241	+3	17
12	Eclipse Solar.	JP. 4610 July 19.557	168	4	13	29.557	+4	11

Modern.

GN. JP.							Cor.	GN. OE.
6	New Year ...	AD. 1886 July 27 OS.	OE. 666	y. 2	m. 1	d. 1	+30	6
6	New Year ...	AD. 1905 July 27 OS.	671	1	1	1	+30	6
6	New Year ...	AD. 1924 July 28 OS.	675	4	1	1	+30	6
6	New Year ...	AD. 1943 July 27 OS.	680	3	1	1	+31	6

OE. NOTES.

(**1**). OE.=Olympic era; and Olympic dates in general, and the Olympic year counted from JP. 3938; and the Olympiad when the odd year is given. Thus in OE. dates, JP. 3938=OE. year 1=OE. 1..y. 1. (28, 35–38, 65.)

(**2**). The Iphitan era began GN. 5 at the date of new moon JP. 3938 July 9.302 =OE. 1..y. 1..m. 1..d. 1.302, as shown in the first example. Jarvis (p. 37) quotes Censorinus, who says, that the year in which he wrote, was the 1014th year from the first Olympiad of Iphitus, and JE. 283 (=JP. 4951), and AE. 267 (=JP. 4951). Then 1014 from 4951=3937 difference, so that OE. began JP. 3938. Then July 9.302 is the date of new moon, next after the summer solstice in JP. 3938. The examples prove that JP. 3938=OE. 1..y. 1. (23–26, 35–37, 47–54, 65.)

(**3**). The Metonic era began GN. 7 JP. 4282 July 15.957,890, as in the example, at new moon next after the summer solstice. (5–16, 21, 25, 26, 29, 30, 35, 41–45, 49, 60–62.)

(**4**). The Calippic era began GN. 14 at new moon next after the summer solstice of JP. 4384 June 29.030, as shown in the example, because the first Calippic correction was in JP. 4384. (Long, Vol. 2, p. 675; and Rees, Calippic; Scaliger, p. 13.) (22, 25, 26, 30–34, 40, 46, 56, 61, 62, 65, 66.)

Metonic Table Construction.

(**5**). Begin with zero, and continue to add 30 days for the beginnings of the successive months, except when the sum equals or exceeds a multiple of 63 days, subtract one day and continue to add 30 days to the remainder. (5–16, 20–26, 29, 30, 35, 36, 40-45.)

(**6**). Then set down the distances thus found for the successive 12 months in a common year and 13 months in an embolismic year, found thus.

(**7**). In JP. 4282 the summer solstice at Athens fell June 27.336,917, and the new moon next thereafter fell July 15.957,890. From these data find the date of each new moon next after the summer solstice, as for MDT. Table, which reduce to calendar time, as in the above Table of New Moons, from JP. 4282 to JP. 4301. (MDC. 4th Example.) (59.)

(**8**). Then divide each of these years JP. by the circle 19 for R=GN., which begins after midsummer. Then mark as embolismic each year in which the date of new moon is earlier than the date in the next year. (HC. Note 59.)

Astronomic Accuracy.

(**9**). Subtract July 15 (represented by zero in the Metonic Table) from July 15.957,890, leaving 0.957,890 (the astronomic distance of new moon after the beginning of the Metonic Cycle). Then continue to add 354.367,068 days for 12 lunations in a common year, and 383.897,657 days for 13 lunations in an embolismic year, to find the equivalents of the dates in the Table of New Moons.

(**10**). The whole numbers of the sums are the same as in the first column of the Metonic Table, and the fractions are the same as in the Table of New Moons, with the single exception of JP. 4286, when the astronomic date is July 1.957, and the Metonic date (represented by 1448) is July 2, or 62 minutes later.

(**11**). Then, to the astronomic distance in this year (JP. 4286=GN. 11)=1847.-956,751, continue to add lunations of 29.530,589 days until the sum=1831.854,418 at the beginning of the next year (JP. 4287), and without exception, the whole numbers are the same as in the Metonic Table.

(**12**). Hence, while using nothing less than whole days, the Metonic Table makes the first days of all these months fall precisely on the days of mean new moon, with the single exception of new year in JP. 4286, when the difference is only 62 minutes. (5–14, 42, 55–57.)

(**13**). But this astronomic accuracy for the first 20 years will not remain the same during subsequent cycles. Because the Metonic Cycle contained 6940 days, while 235 lunations contain 6939.688,415 days. Hence in Metonic time, lunar dates recede 0.311,585 days per cycle. To correct this error Calippus omitted the last day of each fourth Metonic Cycle (beginning JP. 4384 June 29). This made 76 Calippic years the same as 76 Julian years. And in Julian time lunar dates recede 0.061,585 day per cycle. And the dates in the table can be used for all subsequent time to give the mean standard lunar dates. Thus: (MDT.) (14, 40, 55, 56.)

(**14**). From the given year JP. subtract the table year with the same GN., and divide R by 19 for Q of cyles, which multiply by 0.061,585 for the recession, which subtract from the table date for the approximate date. Then subtract JCC. for the table year, and add JCC. for the given year, and subtract 0.400 that Meton's dates exceed standard, and the result will be the same as found by MD. Thus the present year AD. 1886=GN. 6 is 121 cycles after JP. 4300=GN. 6, with new moon July 27.279 Metonic. Then $121 \times 0.061{,}585 = -7.452$ recession leaves July 19.827 approximate, −0.75 JCC. for JP. 4300, +0.50 JCC. for AD. 1886, −0.400 for Meton's standard=July 19.177 Cal. Stand. OS., as found by MD. Add 12 NS. SC.=July 31.177 mean NS., while the actual in the Nautical Almanac=July 31.226. (MD. Second.)

Historic Data (2, 15, 16, 29, 32, 47–54, 62).

(**15**). Meton and Euctemon determined the date of the summer solstice at Athens in terms of the Era of Nabonassar=JP. 4282 June 27 at 5 or 6 hours after midnight. (NE. 2d Ex.; MD. 4th Ex.) They do not give the date of new moon. But Table I. shows that it was accounted about 0.400 more than standard time by MDB. (20.) Dodwell (Jarvis, p. 21) says: "As far as we know, the inhabitants of Elis never reckoned the beginning of their cycles from any other point than the summer solstice.... It is highly probably, that the Olympiads had been celebrated

from the 11th to the 16th of the lunar month after the summer solstice." Jarvis (p. 20) quotes Plato (about JP. 4350), who says: "When the new year is about to commence after the summer solstice at the coming in of the month." Scaliger (p. 36) says: "The oracle was interpreted to signify, that the Olympiad must be celebrated at the full of the moon, which fell precisely on the 15th of the first month." Pindar (Jarvis, p. 18) shows: "That the Olympic Games were celebrated from the 11th to the 16th of the first month, or in other words, for five days, preceding and including the dichomenia or full moon." One Scholiast (Jarvis, p. 18) says: "The Olympic contest takes place at the full moon, and the decision of the judge is pronounced on the 16th day of the month." Another says: "The contest takes place at one time after 49 months, at another after 50 months." Geminus (Jarvis, pp. 12, 16) says: "To measure the days according to the moon, consists in making the denomination of the days follow the illumination of the moon." And see the remarks by Thucydides and by Geminus. (29, 32, 47.) (Petavius, pp. 32, 33.)

(**16**). Geminus describes the Metonic Cycle, as quoted by Petavius in his Uranologion, and in English, by Jarvis (pp. 17, 18), in substance thus: "The Metonic Cycle had 19 years (of which 7 were embolismic)=6940 days=235 months, of which 125 were full (30 days) and 110 were hollow (29 days). Then 6940÷110=63 ratio. So that counting each month 30 days, one day was retrenched after the sum of days thus found exceeded a multiple of 63 from the beginning. And this sometimes brings two months of 30 days together." (5–8, 15, 41–46.)

OE. Rules Explained.

(**17**). *OE. Rule* 1. The days of the months were divided into three decades, and counted as 1st, 2d, etc., of each decade. The first decade was called Archomenou (of the beginning), or Istaminou (of the present). The second was Epideka (after the tenth), or Mesountos (of the middle). The third was Epeikadi (after the twentieth).

(**18**). Also, the first day was called Neomenia, or Noumenia (new moon), the 15th Dichomenia (half month), the last Triacas (30th), even when the month had only 29 days; also Enékainea (the old and the new), also Demetrias.

(**19**). Also, the last decade was counted backward from the first day of the next month, and the 21st was called Dekaté Phthinontos (the tenth before the *Lost* moon) if the month had 30 days, or one less if the month had 29. And Long (Vol. 2, pp. 517, 518) quotes a passage from Homer which contains the words Phthinontos and Istaminoio, and from "Solon who reformed the Greek months." But he translates Phthinontos as "waning." (63, 64.)

(**20**). *OE. Rule* 2. The lunar dates in the table of examples are 0.400 more than standard dates found by MDB. or MDT. Because Table I. shows that this was the Metonic standard, and perhaps gives the actual date of new moon at Athens in JP. 4282. (MD. Second.) For the longitude of Athens add 0.066,296 to standard time (Local). (27–40.)

(**21**). *OE. Rule* 3. The construction of the Metonic Table shows that Meton counted each day as one day advance in date, while our Julian dates make no account of the extra day in a bissextile. Hence these rules are in terms of DJP. Then the Metonic Cycle began JP. 4282 July 15=DJP. 1,563,831. This being date, subtract one day to bring it to distance corresponding with GND. in

the Metonic Table. Then OE. began JP. 3938=19 cycles=131,860 days before the Metonic Cycle, and this from 1,563,830 leaves the constant 1,431,970. Then JP. 3938÷19 leaves GN. JP. 5, which begins Jan. 1. Then to simplify the calculation, JP. 3938=GN. OE. 5, which begins after the summer solstice of GN. JP. 5, and ends in JP. 3939=GN. JP. 6. Hence JP. 3938−3933=5;÷4=OE. 1..y. 1 after the solstice in JP. 3938, but JP. 3939−3934=5;÷4=OE. 1..y. 1, before the solstice in GN. JP. 6. (5–8, 35, 36, 59, 60.)

(**22**). *OE. Rule* 4. Calippus made no change in the Metonic Cycle, except at the end of each fourth Metonic Cycle (counted from JP. 4282) he counted the last Metonic day the first day of the Calippic year, but made the first correction in JP. 4384, by counting June 29 as OE. 112..y. 3..m. 1..d. 1. Hence the Calippic Cycle=27,759 days=76 Julian years, and hence on an average, the dates in the Metonic Table will for all time remain the dates OS. for the same GN., to which NS. SC. must be added for dates NS. But there will at times be the difference of one day, and the precise date must be found by Rule 4, since Calippic dates do not run parallel with Julian dates, while the average is the same. (21, 33, 34, 40, 45, 46, 65, 66.)

(**23**). *OE. Rule* 5. The Iphitan correction of 0.311,585 day per cycle, is the difference between 6940 days in the Metonic Cycle and 6939.688,415 days in 235 mean lunations of 29.530,589 days. Then the year JP. from 4301 and R÷19 for Q (neglecting fractions), gives the number of cycles that the year JP. is before the year with the same GN. in the standard Metonic Cycle. Then Q×0.311,585 from the given date, gives the fraction belonging to the standard Metonic date, while the original fraction belongs to the original date. (2, 23–26, 35–37, 47–54, 65.)

(**24**). The Metonic new moon of GN. 14 fell 1.192,388 day after the summer solstice in JP. 4289. Its advance of 0.004,542,68 day per year in solar date makes it coincide with the summer solstice in JP. 4027. Before that date it fell before the summer solstice. This correction makes Iphitan dates bear the same relation to the summer solstice as the Metonic dates during the first Metonic Cycle.

(**25**). Neither Meton nor Calippus had analogous rules for subsequent dates. (MDT. Mosaic Explanation.) (28, 38, 39, 47–54.)

(**26**). *OE. Rules* 6, 7, 8, are the reverses of OE. Rules 3, 4, 5. And the sum of years first found is 4 years more than the year OE., to simplify the rules. Thus OE. year 1=OE. 1..year 1. Then by rule 6; OE. 1×4;+1=5;÷19=Q0.+GN. 5 =5;÷4=OE. 1..y. 1. Hence JP. 3938=OE. 1..y. 1 is called GN 5. And this accidentally makes OE. GN. and JP. GN. the same at the beginning of the year OE. (21, 26, 35, 36, 59, 60.)

OE. Examples.

(**27**). The dates of eclipses and of new and full moon are found in standard time by MDB., with the addition of 0.400 to correspond with Meton's dates. The actual dates may have been a few hours different. (20.)

(**28**). The Iphitan examples, show that the rules for Iphitan dates, make new moon fall on the first, and full moon fall on the 15th day of the Olympic month. The year JP. 3947 is one of the excepted years (GN. 14) in OE. Rule 5. The eclipse of JP. 3993 is the earliest astronomic date on record. (NE. Note 3; MD. 2d Ex.) (2, 23–28, 35–37, 47–54.)

(**29**). The Metonic examples show that from the beginning of the Metonic

Cycle until JP. 3984, new moon fell on the 1st, and full moon on the 15th of the Metonic month. And with respect to the eclipse of JP. 4283, Thucydides says that it occurred "at the noumenia according to the moon, when also only does it appear possible to happen." (Scaliger, p. 81; Jarvis, p. 4.) (3, 5–16, 21, 25, 26, 29, 30, 35, 41–45, 60–62.)

(30). The example of JP. 4384, shows that the recession of 0.311,585 day per cycle, caused new moon to fall on the last day of the Metonic year, when Calippus added one day to the date and made it the first day of the next year. (4, 22, 25, 26, 30–34, 40, 46, 56, 61, 62, 65, 66.)

(31). The Calippic examples show that the Calippic corrections (of 1 day in JP. 4384 and 3 in 4513, 4514, 4540), were sufficient to make the dates fall as in the first Metonic Cycle. But the Calippic correction of 4 days in JP. 4610, was not sufficient to correct the Metonic recession of 5.297 day, so that in JP. 4610, the solar eclipse fell on the Triacas. (32.)

(32). This will explain the "fixed law" mentioned by Geminus, who wrote JP. 4637, and says: "The solar eclipses always fall on the Triacas, for then the moon is in conjunction with the sun. And according to some fixed law it is that the eclipses of the moon take place in the night which precedes the Dichomenia, for then the moon is diametrically opposite to the sun." (Jarvis, p. 13.) (4, 13, 15, 31, 32.)

(33). The last four examples of GN. 6, are in four successive Metonic Cycles, and the first three in one Calippic Cycle with 30 days correction, and the last in the next Calippic Cycle with 31 days correction, and three in common years while AD. 1924 is a leap year. And three of these new years fall on July 27, OS., which is the same as GN. 6 in the Metonic Table, while the fourth falls on July 28 OS. This shows, that while 76 Calippic years contain the same number of days as 76 Julian years, the dates OS. are not always the same as in the Metonic Table. (4, 22, 46, 65, 66.)

(34). In like manner, the Calippic new year in JP. 4384=GN. 14 falls June 29, while the Metonic new year in JP. 4289=GN. 14 fell June 28. (22, 40.)

Details of Calculation.

(35). *Example 1st.* JP. 3938 July 9.302=OE. 1..y. 1..m. 1..d. 1.302. Then by MDB. find the standard date of new moon, and by OE. Rule 2 add 0.400=JP. 3938 July 9.301,695=DJP. 1,438,178.301,695. Then by OE. Rule 3 subtract the constant 1,431,970=6209.301,695;÷6940=Q0.+GND. 6209.301,695 which is next more than 6202 of GN. 5 month 1, in the Metonic Table, which subtracted leaves month 1 day 7.301,695 Metonic. Then JP. 3938÷19=GN. 5. This being the same as found by rule, subtract 3933 from JP. 3938=5;÷4=OE. 1..y. 1 with m. 1..d. 7.301,695 Metonic.

(36). These are standard rules for all cases, and OE. 1..y. 1 is counted GN. 5, to simplify the rules, so that 5÷4=OE. 1..y. 1. (21, 36, 59, 60.)

(37). Then (by OE. Rule 5) 4301−JP. 3938=363;÷19=Q 19;×0.311,585= 5.920,115, which from d. 7.301,695 leaves d. 1.381,580, for the whole number, day 1, with the original fraction day 1.302. Because the original fraction is the actual date while the fraction as found is the original date reduced to the date of the corresponding GN. in the Metonic Cycle, at JP. 4299 July 8.382.. And in this

case the Metonic date is first found, to illustrate the standard rule, and then the Iphitan correction is subtracted. This is the same in effect as subtracting the correction 5.920,115 from DJP. 1,438,178.301,695 and then proceeding as before. (23.)

(**38**). *Example 2d.* For the exceptions in OE. Rule 5. Then JP. 3947=GN. 14. And JP. 3947 July 29.727,663=DJP. 1,441,486.727,663=OE. 3..y. 2..m. 2..d. 6.-727,663 Metonic. Subtract the Iphitan correction 5 608,530, and retain the original fraction, leaves month 2..d. 1.727,663. But this being GN. 14 before JP. 4207, count it one month less=OE. 3..y. 2..m. 1..d. 1.728. (24.)

(**39**). In the Metonic Table new year of GN. 14 (JP. 4289) falls June 28 and *after* the summer solstice. But in JP. 3947 the same moon falls 0.553 day *before* the solstice, and the next moon fell July 29.727,633. (7, 24.)

(**40**). *Example 13th.* Calippic New moon JP. 4384 June 29.031=OE. 112..y. 3 . m. 12..d. 29.031 in OE. GN. 13 Metonic. (But JP. 4384÷19=JP. GN. 14.) Then OE. GN. 13 will show all the details of that year in the Metonic Table. And GN. 13 is a common year of 12 months, and the last month had only 29 days (2511 to 2540 days after the beginning of the cycle). Hence OE. 112..y. 2 m. 12 d. 29.031 was the last Metonic day in that year. At this point, Calippus made his first correction by advancing the date one day, and this made the same absolute day JP. 4384 June 29, to be OE. 112..y. 3..m. 1..d. 1.031, and the Calippic new year of OE. GN. 14, and the same as JP. GN. 14. (4, 21, 22, 62.)

Contradictions.

(**41**). *Contra. First.* Scaliger (p. 78) gives his theory, and says: "Geminus, an ancient and erudite author, signally fails, who writes that Meton divided 6940 by 110 syzygies, and because 110 is contained 63 times in 6940, therefore he thinks that Meton immediately after 63 days, made the retrenchment of days. The ratio itself refutes this." (57.)

(**42**). Now: Geminus of Rhodes was a Greek astronomer and mathematician, who wrote (about B.C. 77) his account of the cycle which he himself used, as shown by his remark, that solar eclipses always fell on the Triacas, etc. And such authority for a contemporary fact, is more reliable than Scaliger's theoretical assertion (in A.D. 1629) that he "signally fails." On the contrary, the Metonic Table shows that Scaliger is in error, since that table is constructed precisely as directed by Geminus, and the "ratio of 63" produces precisely the results stated by him. And its astronomic accuracy is very remarkable. (5–16, 29, 32, 49, 58.)

(**43**). *Contra. Second.* Scaliger (p. 80) gives his "Table of Metonic Neomenia in Julian months," and puts 6 of the 7 embolismic months in December, and one on January 1.

(**44**). *Now:* December is the last Julian month. But the embolismic months were necessarily the last months of the Metonic year, and necessarily included the date of the summer solstice, which at that time fell on June 27, as determined by MDB. and by Meton. (MD. 4th Ex.) (7, 59.)

(**45**). *Contra. Third.* Scaliger (p. 80), in his table, does not give the years JP. But (p. 13) he shows that it began JP. 4282. And his days of the month prove it, since the years begin at the same dates as in the Metonic Table, except one day later in JP. 4291 and JP. 4296. Hence, on these days, he differs from the state

ments by Geminus. The other dates have not been compared. And this is "A Table of Metonic Neomenia in Julian months," which make no difference for the extra day in a bissextile. while Meton counted every day as one day advance in date. (5, 16, 21, 33, 34.)

(**46**). *Contra. Fourth.* Scaliger (pp. 89, 90) gives his version of "The Table of Neomenia of the Calippic Period." This is for 76 years, and is not a repetition of his version of the Metonic Cycle. But Calippus made no change in the Metonic Cycle, except at the end of 76 years, he counted the last day of the Metonic year, the first day of the Calippic year, as in the example JP. 4384 June 29. (4, 22, 30, 40.)

(**47**). *Contra. Fifth.* Scaliger (p. 24) says that Thucydides says, that the solar eclipse of JP. 4283, happened at "Noumenia according to the moon. Therefore there was a certain noumenia not according to the moon. Diodorus Siculus in Book 12, writes that Meton, the astronomer, established his cycle on the 13th Skirrophorion, so that it is manifest that the new moon of that Skirrophorion was not lunar." This contradicts the Iphitan rule. But the conclusion is not justified by the premises, since this eclipse of JP. 4283 was in the second year of the Metonic Cycle, when the examples prove, that this was not only "a certain noumenia according to the moon," but that this was the general rule. (3, 9–12, 14, 29.)

(**48**). *Contra. Sixth.* Dodwell says that Diodorus Siculus asserts, that the Metonic Cycle began on the 13th Skirrophorion. And Jarvis (p. 19) says, "from this, Dodwell infers, and it seems justly, that in consequence of defective cycles previously in use, an error of 17 or 18 days had occurred, which was then rectified by leaving out the remainder of Skirrophorion, and on the 13th of that month commencing the first month Hekatombaion after the summer solstice."

(**49**). Now, Scaliger and Dodwell contradict the historic data upon which the Iphitan rules are founded upon the single statement of Diodorus, who wrote about 400 years after the eclipse of JP. 4283 to which Scaliger refers, and therefore does not state a contemporary date, as does Geminus, which Scaliger denies. And Lemprierre, in his Classical Dictionary, says of Diodorus: "His manner of reckoning by Olympiads and the Roman consuls will be found very erroneous." (2, 15, 42.)

(**50**). Dodwell's inference supposes, that the philosophic Greeks, who "named the days according to the illuminations of the moon," called the day of new moon Dichomenia, and the day of full moon Neomenia, and held the Olympic Games on the 15th of the month, during the *Lost moon*, while we know that they frequently changed their cycles, to make the names of the days correspond with the illuminations of the moon. (15, 29, 32.)

(**51**). But, supposing in this case, the statement by Diodorus to be correct, it can be interpreted in two ways, to agree with all the historic data upon which the Iphitan rule is founded. (15.)

(**52**). *First.* Mean full moon fell at Athens JP. 4282 June 30.793, which by the Iphitan rule was Skirrophorion 15.793. And as the Romans had a Proleptic Julian year, to correct dates, before the standard date of the Julian Calendar, at new moon, dated Jan. 1 BC. 45, so the Metonic date may have been established at full moon, now called the 15th, but previously the 13th, to correct an error of two days, and not 17 or 18 as Dodwell supposes. (JE. Note 2.)

(**53**). *Second.* In the analysis of the first Roman Calendar, it is supposed (con

trary to authority) that Romulus adopted the calendar of a Greek colony, and that the months began at the astronomic date of new moon, as we know was the fact in the early Hebrew Calendar, and is now the fact with many Mohammedans. And that the word Ides is not "derived from the *obsolete iduare* to divide, because it divides the month," but from the Greek word Eido (pronounced Ido), to see or take an observation on the hour of full moon, and thence determine the number of days to the next new moon, called Kalends by the Romans from the Greek word *Kaleo,* to call out or make proclamation of the number of days to the next new moon. And this Proclamation (Kaleo) made day by day, caused the Roman dates to count backwards. In like manner, OE. Rule 1 shows that in early times the Greeks had a system of dates counting backwards, and the remark by Diodorus might indicate, that at full moon JP. 4282 June 30, a Proclamation was made, that 15 days thereafter would be new moon, and the Metonic Cycle would begin. (AU.)

(**54**). Either of these suppositions makes the error two days, and reconciles the apparent contradiction by Diodorus to all the historic data upon which the Iphitan rule is founded. (2.)

(**55**). *Contra. Seventh.* Jarvis (p. 21) quotes with apparent approval the remark by Dodwell: "To date exactly the beginning of each year according to our computation, would oblige us in every instance to calculate the lunations. This would be unnecessary trouble. It will be sufficient to take the first day of July as the beginning of an Olympiad, and thus reckon the first six months as belonging to one, and the last six months as belonging to another of the four years consisting of 49 or 50 lunar months into which the Olympiads were divided."

(**56**). Now, a calculation of lunations would not give the date "exactly," since neither the Metonic nor the Calippic Cycle was "exactly" astronomic for distant dates. And some months had 30 and others 29 days. (13, 16, 24, 31.)

(**57**). Also, the Metonic Table shows that in the first cycle, the beginnings of the years varied from June 28 to July 27. So that it is not obvious, what use an astronomer or a historian could make of this rule, while Scaliger's rules were printed AD. 1629, and although not precisely correct give close approximations. (5–7, 41–46.)

(**58**). *Contra. Eighth.* Petavius, in his Uranologion (in which he translates the Greek of Geminus into Latin), says that the Calippic Cycle contained 22,759 days. This is a misprint for 27,759 days. Also Jarvis (p. 18) has the same error. (4, 22, 46, 61.)

(**59**). *Contra. Ninth.* Long (Vol. 2. p. 515) states that the embolismic months were inserted at the ends of the years 2, 5, 8, 10, 13, 16, 18 of the cycle. But he does not state the absolute years. Also Scaliger (pp. 78–92) marks the same years as embolismic, when the first year of the cycle is counted GN. 1. But he does not give the absolute years. Geminus only says that there were 7 embolismic years, without stating the number. (6, 7, 16.)

(**60**). Now, the Metonic Table shows that the years of the cycle GN. 8, 11, 14, 16, 19, 3, 5, are embolismic as used herein. All cycles of 19 years necessarily have 7 embolismic years, and those necessarily fall in certain absolute years, as in the Metonic Table. But the numbering of the year in the cycle (or its GN.) is arbitrary, and the dates of new year in Scaliger's Table (p. 80) prove that he counts JP. 4282 as GN. 1. This was probably Meton's arrangement. But JP. 4282 is

herein counted GN. 7, so that JP. 3938 shall be GN. 5, to simplify the rules. The difference is in form—not in substance. (8, 21, 26, 36.)

(**61**). *Contra. Tenth.* Scaliger (p. 13) says that Meton counted 6940 "solid days," to convert which the Calippic period of 27,759 days without a fraction succeeded in the 103d year after the beginning of the Metonic. Also Rees (Calippic) says that the Calippic period began JP. 4384=OE. 112..y. 3. Also Long (Vol. 2, p. 695) says that it began at midsummer BC. 330.

(**62**). Now, JP. 4282 to 4384=102 years as we count. But Scaliger habitually includes both extremes in the Roman mode and calls it 103. So that all agree that the Calippic era began JP. 4384, as in the example. But it began on June 29 JP. 4384 at new moon next after the summer solstice, and not at the solstice. (7, 30, 40, 44.)

(**63**). *Contra. Eleventh.* Long (Vol. 2, pp. 517, 518) says: "In this last decade, the moon was so much in the wane, that they gave it a name from a word that signified to decay or perish, reckoning the days backwards from the last day of the month, and calling the 21st day *Dekatê Phthinontos,* the tenth of the waning or tenth from the disappearing moon if the month consisted of 30 days, or Enneatê Phthinontos, the ninth of the waning if the month consisted of 29 days." (19.)

(**64**). Now: In a month of 30 days, the 21st is the 10th day before the beginning of the nexth month. Hence these dates count backwards from the invisible new moon, since such was the new moon of the Greeks, and not the visible new moon of the Hebrews and Mohammedans. And since *Phthino* signifies to wane or perish, this must signify that the moon has perished or is Lost. If it signified wan ing, the dates should count forward from the 15th and be always the same. (19.)

(**65**). *Contra. Twelfth.* The American Nautical Almanac gives AD. 1886=GN. 6=OE. 666 y. 2, "commencing in July, if we fix the era of the Olympiads.... near the beginning of July of the year 3938 of the Julian Period."

(**66**). Now, there is only one point in which this differs from the rules herein, if counted in NS., since new year fell on July 27 OS.=Aug. 8 NS., as shown in the examples. The Greenwich Nautical Almanac does not give Olympic dates. (1, 2, 22, 33, 34.)

OS. = Old Style as used by the Westerns before (NS. 18).*

1. (1). **DOMINICAL,** by memory for all time.
Subtract one from the year JP. Then
Add this one and the remainder and its fourth, and dividing by 7.
What is left take from 7, and the letter is given.

(2.) Or from the year AD.
Add 4 and the year and its fourth, and dividing by 7,
What is left take from 7, and the letter is given.
And the conditions are the same as (NS. 10–2, 3.)

(3.) Or by (NS. 9), find the year of the Solar Cycle, then opposite to that year find for all time the OS. Dominical in the following table.

1	g. F	5	b. A	9	d. C	13	f. E	17	a. G	21	c. B	25	e. D
2	E	6	G	10	B	14	D	18	F	22	A	26	C
3	D	7	F	11	A	15	C	19	E	23	G	27	B
4	C	8	E	12	G	16	B	20	D	24	F	28	A

To memorize this table, A = 28, and the others in succession, are doubled at the Leap Years.

2. (1.) **EASTER.** Find GN. (NS. 15) and OS. Dominical. Then, in the adjoining table, find the date next after the date opposite to GN., which has the Sunday letter same as the Dominical, and that is the date of OS. Easter, called Hagion Pascha by the Greeks. (AM. 7.)

(2.) Or by memory. Multiply GN. by 11; divide the product by 30, subtract the remainder from March 47 (the perpetual Key date), and the second remainder is the date of full moon (OS. FGND.) if on or between March 21 and 50. If not, then add or subtract 30 days to bring it there. Then find the Ferial for that date by (OS. 3), and Sunday next thereafter is Easter. (NB. GND. 12.)

3. (1.) **FERIAL,** or day of the week. Find OS. Dominical, and thence the Ferial dated OS. by (NS. 13).

(2.) Or divide the year AD. by 4 for quotient and remainder. Then multiply the quotient by 5, and to the product add the remainder, and the constant 1, and the day of March, OS. Then divide the sum by the circle 7, and the remainder 1 to 7 = Sunday to Saturday. (AM. 7.)

4. LEAP YEAR. Divide by 4 the year AD. or the odd years omitting the centuries, and if there be no remainder the year is OS. Leap Year.

5. MOVEABLE FEASTS. Find from the date of OS. Easter by (NS. 6.)

Date.		Sunday Letter.	GN.
March	21	C	16
"	22	D	5
"	23	E	
"	24	F	13
"	25	G	2
"	26	A	
"	27	B	10
"	28	C	
"	29	D	18
"	30	E	7
"	31	F	
April	1	G	15
"	2	A	4
"	3	B	
"	4	C	12
"	5	D	1
"	6	E	
"	7	F	9
"	8	G	
"	9	A	17
"	10	B	6
"	11	C	
"	12	D	14
"	13	E	3
"	14	F	
"	15	G	11
"	16	A	
"	17	B	19
"	18	C	8
"	19	D	
"	20	E	
"	21	F	
"	22	G	
"	23	A	
"	24	B	
"	25	C	

* See NS. Preface, and AC. Notes 81-131: AM. Notes.

SCALE.*

The **SCALE** to measure dates from any standard GN. and GND. first appears in AU. NGN. (NB. GND.) It can be thus formed:

1. *By Addition.* Assume any date as the first limit, and 29 days thereafter as the second limit, and any GN. and GND. as the standard, on or between these limits, as Jan 80 and 109 for OS. FGN. in (NB. GND.) Then to any GN. add 8 in a circle of 19; (*i. e.*, add 8 or subtract 11), and if this produce GN. 1 to GN. 8, date it one day later, but if GN. 9 to GN. 19, date it two days later; and if this exceed the second limit, then subtract 30 days for the same GN., and continue the addition until the original GN. and GND. are reproduced.

2. *By Subtraction.* From GND. of any GN. subtract 11 days to find GND. of the next GN.; except from GND. of GN. 19 subtract 12 days to find GND. of GN. 1. And, in any case, if this bring the date before the first limit, add 30 days for the date of the same GN., and continue to subtract as before until the original GN. and GND. are reproduced.

3. For a *Double Scale* continue the addition (1) until two series of 19 GN. are dated. These will fall on or between the limits of 59 days.

4. For a *Full Cycle* of 235 moons in 19 years, add continually 59 days to each of the dates in the double scale, in a circle of 365 days on or between Jan. 1 and 365, until all the original GN. and GND. are reproduced. That is, when the date of any GN. exceeds Jan. 365, then subtract 365, and add one to GN. Except, thus find the date of GN. 1 from GN. 19, and then subtract one day from the date of GN. 1, and continue as before. Or count the year GN. 19 = 366 days.

5. *By alternation.* Take any date as the single limit, and any GN. and GND. less than 30 days thereafter as the standard; as the limit Jan. 67 and AM. NGN. 3 = Jan. 82 in (NB. GND.) Then to GND. add 30 and 29 days alternately, marking the same GN. at each addition, in a circle of 365 days, and adding one to GN. when 365 are subtracted, and thus continue the alternation until GND. passes the limit, and thus find GN. 4 = Jan. 71. Then taking GN. 4 = Jan. 71, proceed as before to find GN. 5 = Jan. 90. Thus continue each time to begin the alternation with 30 and 29 after passing the limit. Except count the year, GN. 19 = 366 days, and subtract that number when GND. of GN. 19 exceeds 366, to find GND. of GN. 1; and thus continue until the original AM. GN. 3 = Jan. 82 is reproduced.

6. Omitting some remarkable properties of this scale, which are simply curious, since it was found to be not accurate enough for dates in the ancient Olympic calendar (OE.); the entire cycle thus divides itself into 6 double scales, with 7 embolismic months. Six nodes are thus formed where the double scales join. This node is indicated by GN. 9 to 19 falling on the date next after GN. 1 to 11, thus showing that the scale is broken at this point, as at AU. NGN. 9 = April 1, and NC. NGN. 16 at April 6, while NGN. of CP. 1553 is full of nodes and extra spaces.

7. The full cycles NC. NGN. and AU. NGN. (in NB. GND.) are nearly as described in (5th) but not exactly. (NB. AC. 3, 26). AM. FGND. are not by scale in the present form. But to AM. GN. add 3 in a circle of 19, and AM. FGND. becomes OS. FGND. The simplicity of the rules (AC. and NS. 11, 12, 14, 20, 21), arises from the peculiarity of the scale. The same rules will not apply to (AM. 3, 4), because the transfer of the dates of (OS. FGN. to AM. FGN. in NB. GND.), breaks the scale or correspondence between GN. and GND. Hence (NB. NS. 3. 14, Ex.)

* See Preface to NS. The Egyptian rules form a Scale, which was made equidistant with the printed lines, when examining the cycles of which parts are given in GND. In the Appendix these rules are called GN. Rules. (AC. Notes 53–74.)

APPENDIX.

A.=a reference to this Appendix.

A.=Adu=Day i..iv..vi (HC.), *i. e.*, see HC.

AC.=Amended Calendar (C), *i. e.*, see AC. among the Calendars in its alphabetical order.

Actual dates are sometimes more and sometimes less than mean dates. And mean dates are chosen between the extremes to be as near as possible to actual dates. Then other rules are required to find the corrections to the mean so as to find the actual. The mean dates of FGN., NGN., VGN. are given under the head MD.

AD.=Anno Domini=Year of our Lord=Dionysian Era=our usual dates (AM., BC., HC., JP.), *i. e.*, see those symbols in A.

AE.=Actian Era of the Egyptians (C), *i. e.*, see AE. among the Calendars.

Age of the moon=days after conjunction. In general terms it signifies the days after the date of any zero (GN., Zero).

AGND.=Apogee GND., or the date when the moon is furthest from the earth, and PGND.=Perigee GND., or the date when the moon is nearest to the earth.

AJP.=JP.

Alexandrian Canon (AC., NC.)

AM.=Russo-Greek Calendar (C)=Anno Mundi=Year of the World=AD.+5508. Also Before Noon. And 0.00 to 0.50 stand.=0 to 12 hours counted from midnight at Greenwich. And in HC., 6 to 18 hours=AM. But Lindo says if the hours are more than 12, they are so many past noon, and he marks them (erroneously) "M" and "A" (HC. Table).

AM. GN.=GN., found from AM. (AM) Chronological.

ANA.=American Nautical Almanac (GNA., PNA.).

Anglican=Church of England and its descendants (NS., AC.).

Apogee (AGND.).

AR.=Right Ascension=Angular distance from the first point of Aries measured eastward along the Equator, and given in sidereal time (Equinox, Zodiac).

Astronomic rules (MD.).

AU.=AUC.=Anno Urbis Conditœ=Year of the City (of Rome) Constructed=old Roman year (C), before the introduction of the Julian Calendar=JE. (C)

Authors are named in the notes. (AC. 132; ME. 25; HC.; NS. 3.14.)

B.=Betuthakphat=II..15..589=Hebrew numeral (HC.).

B. A.=the present author=original.

Basic=the earliest standard.

Basic age of zero=age of zero at the beginning of JP. *Rule.* Reduce the assumed standard mean date of zero to the year JP. and Jan. Cal. OS. stand., and this into DJP., which divide by a revolution of zero to whole numbers in Q, and subtract R from a revolution and 2d R=Basic age of zero. Thus, the standard FGND., AD. 1853, Sept. 17.993,023 Cal.; NS.; stand. produces the Basic age of FGN.=5.078,489, and of NGN.=19.843,783. And the standard VGND., AD. 1866. March 20.837,442, Cal. NS. Stand. produces the Basic age of VGN.=246.701,622. All are in terms of JP., Jan. Cal.; OS. Stand. (MDB.).

APPENDIX.

BC.=Before Christ (AD., JP.).

Bissextile=JC. 0, but differs from a leap year which is also JC. 0. The bissextile has its intercalary, "Bis-sextum Kalendas Martii," or second Feb. 24, as we count, while the intercalary in a leap year is Feb. 29, and in astronomical calculations, subtract one from the year JP. and divide by 4, and if there be no remainder, the year is accounted a bissextile or a leap year—invariably. But through error, the actual Roman bissextiles did not fall on the regular years from JP. 4672 to JP. 4713 (JE., AE.).

Building of Rome (AU.).

C.=Calendars in their alphabetical order (Era).

Cal.=Calendar or ordinary dates, and in JC. 0 has Feb. 29 and 366 days, and in JC. 1, 2, 3 has 365 days. And the days always begin at the same hour, as Stand. Cal. begins at midnight at Greenwich. But Julian time has no Feb. 29, and all the years=365.25 days, and Min. Stand. begins the day, after Cal. Stand.=0 hours in JC. 0; 6 hours in JC. 1; 12 hours in JC. 2; 18 hours in JC. 3; 24 hours in JC. 4 (Jan. Cal., Month Cal., Jan. Min., Month Min.), JCC.

Calends or *Kalends*=Beginning of the month (JE. Table).

Calendars Compared (C, AC. Notes 81, 85, 89; HC. Note 157).

Calippic cycle (OE.).

Canicular, or Wandering Year (NE., AE.).

Chalcedonian Calendar=AM. and OS. (AC.).

Character=Measure of time, and a date (HC.).

Circle. Rule. To divide by a circle, make Q one less than by ordinary division if the remainder would be nothing, so that the remainder may be the full number of the circle. To add in a circle, subtract the circle when the sum is greater than the circle. To subtract in a circle, add the circle and then subtract if without the circle the remainder would be nothing or negative.

Civil time counts from midnight at the given Longitude (Standard, Hebrew, Local).

Common year=JC. 1, 2, 3=365 days. Also HC. year of 12 months (Bissextile, Leap, Embolismic).

Concurrence is here used to signify the year, when the full moon represented by any GN. falls at the same date as the vernal equinox (MDT. Mosaic).

Conjunction=NGN.=moon close to the sun and invisible=new moon of the almanacs.

Constant=a quantity required in each case.

Construction of rules (Basic age, Key date, MDT., HC. 56–67).

Contra=Contradiction of what is assumed to be correct.

Council=of Nicea, AD. 325, (NC.) of Chalcedon, AD. 534 (AM., OS.).

Chronological Cycles. For the Westerns, divide the year JP. by the circle 19 for GN. or Lunar Cycle, or by the circle 28 for Solar Cycle, or by the circle 15 for Indiction, and R=year of the cycle. For the Russo-Greek cycles, substitute the year AM. for the year JP. Or for the Western lunar cycle, add *one* to the year AD., and divide S by the circle 19. Examples in all almanacs.

Culminate=upper transit.

Cycle=Number of years when zero returns to the same date (Chronological).

D=Date at the end of GND.

DAGND. and DDGND.=Declination Ascending and Descending=Moon's Ascending and Descending Node on the equator. (Equinox.)

APPENDIX.

Day 1 *to* 7=Ferials i to vii=days of the week Sunday to Saturday. Decimals of a day (Hours).

Days Ecclesiastic. Advent Sunday=4th before Christmas, and the first is the Sunday which is nearest to Nov. 30. Agatha=Feb. 5. Agnes=Jan. 21. Alban=June 17. All Hallows=All Saints=All Dead=Nov. 1. All Souls=Nov. 2. Alphege=April 19. Ambrose=April 4. Andrew=Nov. 30; Anne=July 26. Annunciation=March 25=beginning of the year in CP . Ascension=Holy Thursday=39 days after Easter. Ash Wednesday=beginning of Lent=54 days before Easter. Assumption=Aug. 15. Augustine C.D. Aug. 28. Augustine of England May 26. Barnabas June 11. Bartholomew Aug. 24. Bean. O. Sapientia Dec. 16. Bede=May 27. Benedict=Mar. 21. Blasius=Feb. 3. Boniface June 5. Britius Nov. 13. Candlemas=Purification=Feb. 2. Carl, or Care, or Passion Sunday=5th Sunday in Lent=2d Sunday before Easter. Catharine=Nov. 25. Cecilia=Nov. 22. Cedde or Chad=Mar. 2. Christmas=Dec. 25. Circumcision=Jan. 1. Clement=Nov. 23. Conversion of St. Paul=Jan. 25. Corpus Christi=Thursday after Trinity Sunday. Crispin=Oct. 25. Cross=Sept. 14. Cyprian=Sept. 26. David=Mar. 1. Dennis=Oct. 9. Dunstan=May 19. Easter=Sunday next after the ecclesiastical full moon, which falls on or next after the 21st March in NS., or in OS. In 1864 the Greek Easter fell five weeks later than the Western Easter. Edmund A.B.=Nov. 20. Edmund, King, Nov. 20. Edward the Confessor=Oct. 13. Edward, King of the Saxons=March 18, and Translation=June 20. Ember days=Wednesday, Friday, Saturday after 1st Sunday in Lent, and after Pentecost, and after 14th Sept. and 15th Dec. And Ember weeks are the weeks which contain those days. Epiphany=Twelfth day Jan. 6. Ethelred Oct. 17. Eucharist=Easter. Enarchus Sept. 17. Eve or Vigil is the day before a feast. Exaltation of the Holy Cross Sept. 14. Fabian Jan. 20. Faith Oct. 6. Fourth day of a feast is the 3d day after. George April 23. Giles Sept. 1. Good Friday is in Passion week and Friday before Easter. Gregory March 12. Hallows, or Hallowsmas, or All Hallows, or All Saints Nov. 1. Hilary June 13. Holy Cross May 3. Holy Innocents Dec. 28. Holy Rood or Exaltation of the Holy Cross Sept. 14. Holy Thursday or Ascension. Hugh Nov. 27. Innocent Dec. 28. Invention of the Holy Cross May 3. James July 25. James and Philip May 1. Jerome or Hierome Sept. 30. Jesus—name of, Aug. 7. John Dec. 27. John Baptist—beheading of, Aug. 29. Ditto Nativity, called Midsummer, June 24. John the Evangelist ante Portam Latinum May 6. Jude and Simon Oct. 28. Katharine Nov. 25. Lady—our, see Mary. Lambert Sept. 17. Lammas Aug. 1. Laurence Aug. 10. Lent begins with Ash Wednesday. Leonard Nov. 6. Low Sunday is next after Easter. Lucian July 8. Lucy Dec. 13. Luke Oct. 18. Machatus Nov. 15. Margaret July 20. Mark April 25. Martin Nov. 11, and Translation of, July 4. Mary—Conception of, Dec. 8, and Nativity Sept. 8, and Annunciation March 25, and Visitation July 2, and Purification Feb. 2, and Assumption or Death Aug. 15. Mary Magdalene July 22; Matthaias Feb. 24. Matthew Sept. 21. Maundy-Thursday is next before Good Friday. Michael and all angels Sept. 29. Midlent is 4th Sunday in Lent Midsummer is John Baptist's Nativity June 24. Morrow of a feast is the day after. Nativity Dec. 25. Nicomed June 1. Nicholas Dec. 6. Octave or Utas of a feast is the 7th day after. Palm Sunday is first before Easter. Paschal Sabbath is Easter. Passion Sunday is Carl Sunday, and Passion Week is next before Easter

Paul's Conversion June 25. Paul at Rome July 6. Pentecost or Whitsunday is 7 weeks after Easter. Perpetua Mauritan March 7. Peter June 29; In Cathedra Feb. 22; at Rome Jan. 18; in Vincula or Lammas day Aug. 1. Philip and James May 1. Powder or Gunpowder Plot Nov. 5. Prisca Jan. 18. Purification Feb. 2. Quadragesima is first Sunday in Lent, is 6 weeks before Easter. Quinquagesima or Shrove Sunday is 7 weeks before Easter. Quinziane, or Quinsime, or Quindisme is one week before and after Easter. But in all other cases it begins with the feast and extends to two weeks after. Relick Sunday is July 9 to 15, or the third Sunday after Midsummer day. Remigius Oct 1. Richard April 3. Rogation days are Monday, Tuesday, Wednesday after Rogation Sunday, which is 5 weeks after Easter. Saints—All or All Hallows Nov. 1. Septuagesima and Sexagesima are 9 and 8 weeks before Easter. Shrove Tuesday is next before Ash-Wednesday, and next after Shrove or Quinquagesima Sunday. Sylvester Dec. 31. Simon and Jude Oct. 28. Stephen Dec. 26. Swithun July 25. Thomas Dec. 21. Transfiguration Aug. 6. Trinity Sunday is 8 weeks before Easter. Valentine Feb. 14. Vigil, see Eve. Vincent June 22. Whitsunday or Pentecost. (Wheatly, Missal, Bond, CP. 1752.) Some customs depend upon these days. The English terms of Court and of the Universities are given in ecclesiastical days. And the great Derby races in England are on the 7th Wednesday after Easter. And the writer can identify the date Nov. 1, 1837, in Venice, from the ceremonies "Pour toutes les morts," or All souls. For Hebrew ecclesiastical days see the calendar HC.

DDGND. (DAGND.)

Dionysian Period=AD. and BC.=our ordinary dates, and so called because proposed by Dionysius Exiguus. First used AD. 525. But the Russo-Greeks (AM.) used AM. until AD. 1725.

DJP. Rule 1*st.* For Days in the Julian Period: Reduce the date in any Era to the year JP., and Jan. Cal. OS. Then subtract 2 from the year JP., and divide 1st R by 4 for Q and 2d R. Then multiply Q by 1461 and 2d R by 365. Then to these two products add the constant 365 and the day of Jan. OS., and S=DJP. (MDB.; AE.; ME., NE., OE.)

DJP. Rule 2. To reduce: Subtract 365 from DJP. Divide 1st R by 1461 for 1st Q, and 2d R. Divide 2d R by 365 for 2d Q and 3d R=Jan. Cal. OS. Then multiply 1st Q by 4, and to P add 2d Q, and the constant 2, and S=year JP. Then by Jan. Cal. table reduce Jan. Cal. to Month Cal. (MDB.; NE.; AE.; ME., OE.)

Dominical is the Sunday letter for the year JC. 1, 2, or 3, but for part of the year in JC. 0. And every date which has its Sunday letter the same as the Dominical for the year is Sunday that year—Sunday is the same absolute day in all calendars. The Sunday letters are the same. But the same day has different dates in OS. and in NS. Hence the Dominicals are different. The rules for Dominicals OS. are given in OS., and for Dominicals NS. are given in NS. And memorized rules for Dominicals NS., and for Sunday letters in AC. Rules 9, 10. They are found opposite to the year of the Solar Cycle NS. and OS. And this year for both is found by the rule for Chronological cycles. (Solar Cycle.)

E=Embolismic year of 13 months (HC.; HCM.).

Easter is Sunday next after the full moon which falls on or next after the vernal equinox according to the Paschal Canons. This date is represented by the date of GN. NS., and of GN. OS. (NS., OS., AM., AC., MDC.). It can be easily memorized (AC. Note 71).

Ecliptic is the apparent path of the sun among the stars (Equinox, Zodiac, Sign, Precession).

Egyptian year=AE., NE. (C). Egyptian cycles (AC., JE. Table).

Embolismic month=13th month in a lunar year, and Embolismic year=a lunar year of 13 months (E., HC., HCM., OE., AC.). And a lunar year of 355 days in the Turkish calendar (ME.).

Epact=10.882,932 days in MDC., MDT.=the difference between 12 lunations of 29.530,589 days, and a Julian year of 365.25 days. In astronomic general terms, it is what the greatest number of revolutions within the year falls short of 365.25 days. The Egyptian epact (AC. Rules, MDC.). Epacts used by the Church of Rome (JE. Table, AC. Notes 29, 30, 61, 120–130; NS. Table VII.). It is called the Lunar Base in AM.).

Equator=the great circle equi-distant from the poles of the earth.

Equinox Vernal=VGN., and the zero of solar dates (MD.). VGND. falls about March 20, when the sun coming north and apparently revolving in the path of the ecliptic crosses the equator at the "equinoxial point," or "First point of Aries." From this point the position of each heavenly body is calculated in longitude eastward along the ecliptic, and in latitude north or south of the ecliptic, and this is reduced to right ascension (AR.) counted eastward from the same point, and reduced to sidereal time, and declination or angle north or south of the equator. To facilitate the calculation, this point is assumed to be fixed. But like a top slowly revolving about the pin, while rapidly revolving on its centre, so the pole of the earth is slowly revolving about the pole of the heavens, and our North Star is far distant from Thuban or *a* Draconis, which was the North Star about 4600 years ago. This causes the equinoxial point to move westward along the equator among the stars at the rate of the semi-diameter of the sun in about 19 years, or a full circle in about 25,000 years. And since AR. is counted eastward, this western movement of the equinox is called "The precession of the equinoxes." Hence, stars which are absolutely fixed are counted as moving eastward, and "The first point of Aries" of calculation is about a sign of the zodiac or 30 degrees west of the beginning of the constellation Aries. And so of the other signs of the zodiac. This was first discovered by Hipparchus (Long, 1331).

Equinoxial year=mean year=365.242,216 days.

Era=AC., AE., AM., AU., HC., HCM., JE., ME., NE., NS., OE., OS. (C.).

Examples are given to illustrate the rules. The rules found elsewhere are frequently obscure for want of examples.

February Cal. has Feb. 29 in a leap year or second Feb. 24 in a bissextile ;=JC. 0. But in Julian time (Min. or Max.), February has no intercalary and all the years= 365.25 days (Jan. Min.)

Ferial=Day of the week, I. to VII.=Sunday to Saturday. The Greeks number the days I. to V. Then *Paraskeue*=day of "preparation"=Friday, and *Sabbaton*=Saturday (Dominical, HC. Rule 7).

FGND.=Full moon, GND. Astronomic in MD. But to distinguish the ecclesiastical full moons of Nisan, NS. FGND. and OS. FGND. are used in MDC.

First point of Aries (Precession, Zodiac, Equinox).

Fractions of a day (Hours).

Full moon=FGN.

G.=Getrad=III..9..204=Hebrew numeral (HC. rule 3).

GN.=Golden Number=the year of any cycle, and in VGN. only represents the year. Originally this term was applied to the numbers I. to XIX. on the marble calendars of the Romans, which were gilt to distinguish them as years of the lunar cycle, and placed opposite to the dates on which the 235 new moons fell in each cycle of 19 years (AC., JE.).

GNA.=Greenwich Nautical Almanac.

GN. AM.=GN. found from AM., the Greek year of the World.

GND.=Date of zero in that GN.

GN. HC.=GN. of the Hebrew Calendar (HC.).

GN. JP.=GN. found from JP., as GN. NS. ; and GN. OS. And all astronomical GN. are GN. JP.

GN. Rules=Egyptian rules (AC. Rules).

Great lunar cycle=6501 years, in which the 235th moon represented by any GN. advances a full lunation of 29.530,589 days, and the 234th moon falls at the same equinoxial date that the 235th moon did 6501 years before that date. NS. Table II. makes it 6977 years. AM. and HC. and OS. make it infinite (MDT., Mosaic Explanation, HCM., AC.).

Greek (AM.).

Greenwich, near London, in England, has recently been agreed upon as the universal prime meridian, from which to count longitude and standard time from midnight, by all except the French delegates. Hence Stand. = counted from midnight at Greenwich. And in the U. S. A. the local standard is becoming general, to make no change except for hours, by subtracting one hour for each 15 degrees of longitude from Greenwich, so that all chronometers shall show Greenwich time counted from midnight (instead of nautical time from noon), and all local time in U. S. A. will show the same minutes as the chronometers, and differ only in the hours. And at the present date (April, 1885) time is kept the same from Boston to Charleston, or 5 hours less than Stand.

Gregorian Calendar=NS. (NS. Introduction).

Hagion Pascha=Greek Easter (AM., Dominical, MDC.).

Hebrew Calendar=HC., HCM.

Hebrew time. Add 0.348,148 to Stand.

Heliacal rising. Long (sec 1329) says that the smallest stars cannot be seen during twilight, or unless the sun is 18 degrees below the horizon. Those of the 6th magnitude require the sun to be depressed 17 degrees. Those of the first magnitude require 12 degrees, Mars and Saturn 11 degrees, Jupiter and Mercury about 10, and Venus not above 5, and she may often be seen in bright sunshine. In many of the old calendars the risings of the stars are given, and this signifies when they first become visible in the East before sunrise.

Hours from decimals of a day. *Rule.* Multiply the fraction of a day by 24 for hours and fraction. Multiply the fraction of hours by 60 for minutes and fraction. Multiply the fraction of minutes by 60 for seconds and fraction.

Hours into decimals of a day. *Rule.* Divide hours by 24 for quotient of decimals carried to any extent. And divide minutes by 1440 for quotient. And divide seconds and fraction by 86,400 for quotient. Collect the quotients. Or use the following Hour Table.

3. To convert Hours, Minutes, and Seconds into Decimals of a Day.

Hours.	Decimals.	Minutes.	Decimals.	Seconds.	Decimals.
1	.0416+	1	.000,694+	1	.000,011,6
2	.0833+	2	.001,388+	2	.000,023,1
3	.1250+	3	.002,083+	3	.000,034,7
4	.1666+	4	.002,777+	4	.000,046.3
5	.2083+	5	.003,472+	5	.000,057,9
6	.2500+	6	.004.166+	6	.000,069,4
7	.2916+	7	.004,861+	7	.000,081,0
8	.3333+	8	.005,555+	8	.000,092.5
9	.3750+	9	.006,250+	9	.000,104,2
10	.4166+	10	.006 944+	10	.000,115.7
11	.4583+	11	.007.638+	11	.000,127,3
12	.5000+	12	.008,333+	12	.000,138,9
13	.5416+	13	.009,027+	13	.000,150,5
14	.5833+	14	.009,722+	14	.000.162,0
15	.6250+	15	.010,416+	15	.000,173,6
16	.6666+	16	.011,111+	16	.000,185 2
17	.7083+	17	.011,805+	17	.000,196,8
18	.7500+	18	.012,500+	18	.000,208.3
19	.7916+	19	.013,194+	19	.000 219,9
20	.8333+	20	.013,888+	20	.000,231,5
21	.8750+	21	.014,583+	21	.000,243,1
22	.9166+	22	.015,277+	22	.000,254,6
23	.9583+	23	.015,972+	23	.000,266,2
24	1.000+	24	.016,666+	24	.000 277,8
		25	.017,361+	25	.000,289,4
		26	.018,055+	26	.000,300,9
		27	.018,750+	27	.000,312,5
		28	.019,444+	28	.000,324,1
		29	.020,138+	29	.000,335,6
		30	.020,833+	30	.000,347,2
		31	.021,527+	31	.000,358 8
		32	.022,222+	32	.000,370,4
		33	.022,916+	33	.000,381,9
		34	.023,611+	34	.000,393.5
		35	.024,305+	35	.000,405,1
		36	.025,000+	36	.000,416,7
		37	.025 694+	37	.000,428,2
		38	.026,388+	38	.000,439,8
		39	.027,083+	39	.000,451,4
		40	.027.777+	40	.000,463,0
		41	.028,472+	41	.000,474.5
		42	.029,166+	42	.000,486,1
		43	.029,861+	43	.000,497,7
		44	.030,555+	44	.000,509,3
		45	.031,250+	45	.000,520,8
		46	.031.944+	46	.000,532,4
		47	.032,638+	47	.000,544,0
		48	.033,333+	48	.000,555,6
		49	.034,027+	49	.000,567,1
		50	.034,722+	50	.000,578,7
		51	.035,416+	51	.000,590,3
		52	.036,111+	52	.000 601,9
		53	.036,805+	53	.000,613,4
		54	.037,500+	54	.000,625,0
		55	.038,194+	55	.000,636 6
		56	.038,888+	56	.000,648,1
		57	.039,583+	57	.000,659,7
		58	.040,277+	58	.000,671,3
		59	.040 972+	59	.000,682,9
		60	.041,666+	60	.000,694,4

The sign + signifies that the last figure repeats to infinity.

For Decimals of a Second, find the same number among the Seconds, and then take its equivalent Decimal, with the Decimal point moved to the left, as many places, as there are places of Decimals of a Second used as above.

For Decimals less than 0.0001; find the same number in 0.0010. Then remove the Decimal point of Seconds, to the left, as many places, as the places exceed four.

To convert Decimals of a Day into Hours, Minutes, and Seconds.

Decimals.	H.	M.	S.	Decimals.	H.	M.	S.
.01	0	14	24	.61	14	38	24
.02	0	28	48	.62	14	52	48
.03	0	43	12	.63	15	7	12
.04	0	57	36	.64	15	21	36
.05	1	12	0	.65	15	36	0
.06	1	26	24	.66	15	50	24
.07	1	40	48	.67	16	4	48
.08	1	55	12	.68	16	19	12
.09	2	9	36	.69	16	33	36
.10	2	24	0	.70	16	48	0
.11	2	38	24	.71	17	2	24
.12	2	52	48	.72	17	16	48
.13	3	7	12	.73	17	31	12
.14	3	21	36	.74	17	45	36
.15	3	36	0	.75	18	0	0
.16	3	50	24	.76	18	14	24
.17	4	4	48	.77	18	28	48
.18	4	19	12	.78	18	43	12
.19	4	33	36	.79	18	57	36
.20	4	48	0	.80	19	12	0
.21	5	2	24	.81	19	26	24
.22	5	16	48	.82	19	40	48
.23	5	31	12	.83	19	55	12
.24	5	45	36	.84	20	9	36
.25	6	0	0	.85	20	24	0
.26	6	14	24	.86	20	38	24
.27	6	28	48	.87	20	52	48
.28	6	43	12	.88	21	7	12
.29	6	57	36	.89	21	21	36
.30	7	12	0	.90	21	36	0
.31	7	26	24	.91	21	50	24
.32	7	40	48	.92	22	4	48
.33	7	55	12	.93	22	19	12
.34	8	9	36	.94	22	33	36
.35	8	24	0	.95	22	48	0
.36	8	38	24	.96	23	2	24
.37	8	52	48	.97	23	16	48
.38	9	7	12	.98	23	31	12
.39	9	21	36	.99	23	45	36
.40	9	36	0				
.41	9	50	24	.001	0	1	26.4
.42	10	4	48	.002		2	52.8
.43	10	19	12	.003		4	19.2
.44	10	33	36	.004		5	45.6
.45	10	48	0	.005		7	12·0
.46	11	2	24	.006		8	38.4
.47	11	16	48	.007		10	4.8
.48	11	31	12	.008		11	31.2
.49	11	45	36	.009		12	57.6
.50	12	0	0	.010		14	24.0
.51	12	14	24				
.52	12	28	48	.0001	0	0	8.64
.53	12	43	12	.0002			17.28
.54	12	57	36	.0003			25.92
.55	13	12	0	.0004			34.56
.56	13	26	24	.0005			43.20
.57	13	40	48	.0006			51·84
.58	13	55	12	.0007			60.48
.59	14	9	36	.0008			69.12
.60	14	24	0	.0009			77.76
				.0010			86.40

Ides, in the Roman year (JE., AU.), fell on the 13th of Jan., Feb., April, June, Aug., Sept, Nov., Dec., and on the 15th of March, May, July, Oct. And the nones fell 8 days before the Ides, or on the 5th when the Ides fell on the 13th, and on the 7th when the Ides fell on the 15th, as we count (JE. Table).

Index number in NS. Tables II., III., and in AC. Tables II., III., gives the number of days after March 21, NS., on which falls the date of GN. 3, as the standard (AC., NS.).

Indiction. The year of Indiction found by the rule for Chronological cycles is the same year of the Roman and of the Greek cycle. It began AD. 313.

Initials of the words signified are used as symbols.

Intercalary=Feb. 29 in a leap year, and second Feb. 24 in a bissextile. The year NE. had 12 months of 30 days, and at the end 5 intercalary days called *Epagómenai.* The year AE. was a modification of NE., and had a sixth *Epagomenas* added in the same years as the Roman Bissextile (AE., NE., JE.).

Iphitus (OE.).

Jach=18 hours=Hebrew numeral (HC.). Changed to 10 hours in HCM. (HC. Rule 3).

Jan. Cal. Table. 0+Jan.; 31+Feb.; 59 (60)+March; 90 (91)+April; 120 (121) +May; 151 (152)+June; 181 (182)+July; 212 (213)+Aug.; 243 (244)+Sept.; 273 (274)+Oct.; 304 (305)+Nov.; 334 (335)+Dec.

Rule 1. To find the day of January in Calendar time, add the given day of the given month to the number prefixed to that month in the table, using the smaller number in JC. 1, 2, 3, but the larger number in JC. 0 or leap year.

Or by memory. Add together all the days in the previous months and the given day of the given month, counting February=28 days in JC. 1, 2, 3, but 29 days in JC. 0. (Jan. Min.)

Rule 2. To reduce Jan. Cal. Subtract the next smaller number in the table (using the smaller number in JC. 1, 2, 3, but the larger number in JC. 0) and R= day of the month Cal. to which that number is prefixed.

Or by memory. Add together the days in the successive months (counting Feb. =28 days in JC. 1, 2, 3, but 29 days in JC. 0) until the sum is next less than Jan. Cal. Then subtract S from Jan. Cal. and the remainder=day of the month Cal., next after the month added to the sum.

Rule 3. Use Jan. min. table as it stands in JC. 1, 2, 3, but in JC. 0, count Jan. one day more or day of the month one day less, on and after March 1.

APPENDIX.

Jan. Min.=Day of January in minimum Julian time.

Jan. Min. Rule 1. For month Cal. find the date of zero, in terms of Jan. min. by MDT. Then in Jan. min. table, find month min. opposite to Jan. min. Then to month min. add JCC. for month Cal. And if this make as much as Dec. 32, then subtract 31 to find the day of January of the next year. And for month min. JCC.=0.00 in JC. 0 after Jan. 59, but JCC.=1.00 in JC. 0 before Jan. 60; and JCC.=0.25 in JC. 1; and 0.50 in JC. 2, and 0.75 in JC. 3.

Thus. In JC. 0, Jan. min. 59 and 60=Feb. min. 28 and March min. 1st=Feb. Cal. 29 and March Cal. 1st. And in JC. 3; Jan. min. 365.900 =Dec. min. 31.900 ;+0.75 JCC.=Dec. Cal. 32.65=JC. 0 Jan. Cal. 1.65.

JAN. MIN. TABLE.

Month Min.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	1	32	60	91	121	152	182	213	244	274	305	335
2	2	33	61	92	122	153	183	214	245	275	306	336
3	3	34	62	93	123	154	184	215	246	276	307	337
4	4	35	63	94	124	155	185	216	247	277	308	338
5	5	36	64	95	125	156	186	217	248	278	309	339
6	6	37	65	96	126	157	187	218	249	279	310	340
7	7	38	66	97	127	158	188	219	250	280	311	341
8	8	39	67	98	128	159	189	220	251	281	312	342
9	9	40	68	99	129	160	190	221	252	282	313	343
10	10	41	69	100	130	161	191	222	253	283	314	344
11	11	42	70	101	131	162	192	223	254	284	315	345
12	12	43	71	102	132	163	193	224	255	285	316	346
13	13	44	72	103	133	164	194	225	256	286	317	347
14	14	45	73	104	134	165	195	226	257	287	318	348
15	15	46	74	105	135	166	196	227	258	288	319	349
16	16	47	75	106	136	167	197	228	259	289	320	350
17	17	48	76	107	137	168	198	229	260	290	321	351
18	18	49	77	108	138	169	199	230	261	291	322	352
19	19	50	78	109	139	170	200	231	262	292	323	353
20	20	51	79	110	140	171	201	232	263	293	324	354
21	21	52	80	111	141	172	202	233	264	294	325	355
22	22	53	81	112	142	173	203	234	265	295	326	356
23	23	54	82	113	143	174	204	235	266	296	327	357
24	24	55	83	114	144	175	205	236	267	297	328	358
25	25	56	84	115	145	176	206	237	268	298	329	359
26	26	57	85	116	146	177	207	238	269	299	330	360
27	27	58	86	117	147	178	208	239	270	300	331	361
28	28	59	87	118	148	179	209	240	271	301	332	362
29	29		88	119	149	180	210	241	272	302	333	363
30	30		89	120	150	181	211	242	273	303	334	364
31	31		90		151		212	243		304		365

Jan. Min. Rule 2. For Jan. Cal. By MDT. find the date of zero in terms of Jan. min. Then for Jan. Cal. add JCC. as for month Cal. except in JC. 0, count JCC.=1.00 for the whole year. Then prove the calculation by finding precisely the same date by MDB. Then in Jan. min. table find month Cal. opposite to Jan. Cal. except in JC. 0, after Jan. 59 take Month Cal. one day less.

Thus : In JC. 0, MDT. makes full moon AD. 1288, Jan. min. 71.836,594. Add 1.00 JCC.=Jan. Cal. 72.836,594 as found by MDB. opposite to March 13=March 12.836,594.

Jan. Min. Rule 3. In terms of Jan. min. Add or subtract mean revolutions to any extent in years of 365.25 days, and find the result by Rule 1 or 2.

Thus : JC. 0 Jan. min. 60,+365 ;÷365.25 leaves Jan. min. 59.75 in JC. 1. Then for Jan. Cal. add 0.25 JCC.=Jan. Cal. 60. This is the same as in JC. 0, and March 1 in JC. 1 is 365 days after March 1 in JC. 0.

Jan. Min. Rule 4. By memory. Add together the days in the previous months and the given day of the given month and the sum will be Jan. min. if February be always counted 28 days.

Jan. Min. Explanation. The Julian year of calculation=365.25 days. It has no intercalary Feb. 29, but makes 1461 days in 4 years, by adding 0.25 to the end of Dec. 31 of each year. Then, in JC. 0, March 1st is Jan. 61 in calendar time, but

Jan. 60 in Julian time, or one day less, and hence minimum. Then taking JC. 0 March 1=Jan. min. 60 as the standard, JCC.=0.00 to the end of Dec. 31. Then the addition of 0.25 carries Jan. min. to Jan. Cal. 1.25 in JC. 1, then to Jan. Cal. 1.50 in JC. 2; and to Jan. Cal. 1.75 in JC. 3; and to Jan. Cal. 2.00 in JC. 4 or JC. 0. And Jan. min. falls one day more than Jan. Cal. in JC. 0, until Jan. Cal. throws in the intercalary, Feb. 29 in a leap year, and makes them the same. Then Jan. min. 60=March min. 1st+0.00 JCC.=March Cal. 1st as at first.

But by Rule 2. When counted in the day of Jan. March 1st in JC. 0=Jan. 61, so that in JC. 0, JCC.=1.00 for the whole year.

JC. Rule. For the year of the Julian cycle of 4 years, counting leap year or bissextile=JC. 0. Subtract nothing from the year AD., but subtract *one* from the year JP., and BC., and HC., and JE. Then divide R by 4 and second R=0, 1, 2, 3 =JC. 0, JC. 1, JC. 2, JC. 3. And count JC. 0=JC. 4 before Feb. 29. (Jan. Min.)

JCC. Rule. For JC. correction. Multiply JC. by 0.25. (Jan. Min.)

JE.=Julian Era=Julian Calendar. (C.) Also Julian Equation. (MDK., MDC., MDT.) Jewish Calendars. (HC., HCM.)

JP.=Julian Period. *Rule.* To find the year JP. (=AJP.) add 4713 to the year AD., or subtract the year BC. from 4714. And to reduce JP., subtract 4713 for the year AD. or subtract the year JP. from 4714 for the year BC. For other calendars the rules are there given. (C.)

JP. GN.=GN. found from JP.=all astronomical GN. And GN. NC., GN. OS., and GN. NS. But these can be thus found: Add one to the year AD., and divide S by the circle 19 and R=JP. GN.

Julian Period=JP. This is an artificial calendar as a universal standard for dates in all calendars, through which a date in one calendar can be transformed into the date in any other calendar, or dates from all calendars can be retained as dates JP. to be compared. It is so called from its resemblance to the Julian Calendar (JE.). It is calculated backwards until the year 1 of the three western Chronological cycles meet in the same year=JP. 1. And counted backwards from JE. 1=BC. 45=JC. 0=Bissextile, it makes JP. 1=JC. 0. And beginning with JP. 1 =JC. 0, it counts every fourth year thereafter as a bissextile or a leap year. Counted forwards it makes JE. 1=BC. 45=JC. 0 and every fourth year thereafter a bissextile or a leap year, and therefore is uniform, while the Romans through error, did not put the intercalaries in the same years as JP. after BC. 45 until AD. 4. And AD. 1 was the first regular year after this confusion (JE.). Hence all calculations for indefinite periods are in OS. carried back to JP. 1. Because before NS. Introduction, each fourth year was a leap year or a bissextile. The Russo-Greeks still retain OS., and their leap years count every fourth year from BC. 45 as if JE. had been counted regularly. The irregularities of NS. are then thrown in by adding NS. SC.

Scaliger, who introduced this use of JP., has been charged with plagiarism, because AM., "the Constantinopolitan Period," like JP., makes AM. 1=year 1 of all the Greek Chronological cycles. But Scaliger does not claim that he invented this short mode of finding the years of the cycles. His improvement was the use of JP. as a common standard of dates. And although the Metropolitan of Kiev, in his "Full Christian Calendar," in Sclavonic text with Arabic numerals (AM.), gives the year AM. with its corresponding years of the three cycles, still its use appears to be so little known among the Greeks, that the author of a Greek "Book

of the Litany" takes three pages for the rules to find the years of the three Greek cyles. These works were lent to me by "Father Agapius," with a manuscript Greek translation of the Sclavonic text.

Julian time is counted by Julian years. (Jan. Min.)

Julian year=365.25 days. (Jan. Min.)

Kalends. (Calends; JE. Table)=First day of the month in AU. and JE.

Key Date=standard date from which to determine the date of each GN. in the cycle. In all cases add an epact to the date of GN. 1 and S=key date. (MDC.; AC. Notes.)

Key Epact is analogous to Key date. (AC. Rule 5.)

LAGND.=Latitude Ascending GND., as LDGND.=Latitude Descending GND.=date of the moon's Ascending and Descending node upon the ecliptic. (DAGND.; Equinox.)

Latitude in the heavens=angle North or South of the Ecliptic, while Declination is angle North or South of the equator. (Equinox.)

LC.=Lunar Correction. (NS.)

LDGND. (LAGND.)

Leap year=JC. 0, with the intercalary Feb. 29, as Bissextile=JC. 0 with the intercalary between Feb. 24 and 25. And to find JC. 0, subtract nothing from the year AD. or AM., but subtract one from the year BC., or JP., or JE., or HC. Then divide R by 4, and if there be no remainder, the year=JC. 0, invariably in calculation=date OS. But through error the Romans counted the wrong years. And NS. counts as common years all centurial years AD. which leave any remainder when the centuries are divided by 4, as AD. 1700, 1800, 1900, 2100.

Local Almanacs give local time, on the basis of standard time given in the nautical almanacs. The rise and set of the heavenly bodies vary with the latitude as well as the longitude. (MDE.)

Local time. Rule. Multiply the degrees of longitude from Greenwich by 0.002,778, and minutes by 0.000,046; and seconds and fractions by 0.000,001, and the sum= fraction of a day to be added to standard time if the locality be East or subtracted if West.

Or: Multiply degrees by 4 minutes, and minutes by 4 seconds, and seconds and fraction by 0.066 for seconds and fraction, and the sum will be the difference in time.

Or: If longitude be given in time find the fraction of a day by the Hour table.

Examples in which+ =East, and — =West:

LOCALITY.	H..M..S.	FRACTIONS.	
Babylon	+2..56..39	+0.122,674	MD. 2d Ex.
Mecca	+2..40..32	+0.111,481	ME.
Jerusalem	+2..21..20	+0.098,148	HC., HCM., AC.
Alexandria	+2.. 1.. 4	+0.084,074	AC. Note 83.
Athens	+1..35..28	+0.066,296	MD..4th Ex.
Rome	+0..49..54	+0.034,653	JE. Note 3.
Greenwich	0.. 0.. 0	0.000,000	Standard; Prime.
75 degrees West	—5..00..00	—0.208.333	Local Standard.

APPENDIX.

Lon=Longitude (Local).

Lunar Base=Epact (AM.).

LC.=Lunar Correction (NS.)

Lunar Cycle=235 lunations in 19 years. (Great.)

Lunation=Synodic revolution of the moon, from full to full or from new to new=29.530,589 days. (MD.; MDB.; MDC., MDE.; MDT.)

March 21 in OS. and NS. and AC., is the ecclesiastical date of the vernal equinox (AC. Notes 1–16.)

Max.=Maximum Julian date=latest date when counted by day of the month after Feb. 29=Cal. in JC. 3. For max. Hebrew date add 1.098,148 to min. stand., *i. e.* add 0.75 JCC. for max. stand., +0.098,148 for longitude of Jerusalem, +0.25 to count from 6 hours before midnight. (AC. Notes 12–16, 32, 50, 52, 86, 91.)

MD.=*First* Mean Date, on the basis of a mean year=365.242,216, and standard VGND.=AD. 1866 March 20.837,442, Cal., NS., Stand., as the mean between the extreme variations of the actual 0.007,582 more and less than the mean, between AD. 1866 March 20..19 h..55 m. and AD. 1870 March 20..19 h..32 m. And 365.242,216 is the estimate of a mean year in GNA. since 1857. In 1856 (p. 581) it says: "The equinoxial year has been assumed, according to Bessel (*Conn. des Temps* 1831, Additions page 154), equal to 365.242,217 mean solar days." Delambre says that NS. SC. by omitting 3 days in 400 years OS. has an error of one day in 3600 years. This makes the mean year 365.242,222 days. And Smyth (pp. 83, 115) gives 365.242,241,4 as the estimate of Baily in 1827. And a mean year of 365.242,216 makes the summer solstice at Athens JP. 4282 June 27..8 h..48 m. after midnight, while Meton estimated it 5 or 6 hours when modern instruments of precision were unknown. And this was 2300 years before AD. 1869. (MD. 4th Ex.) (AC. 12.)

MD. Second. Also, on the basis of a mean lunation=29.530,589 days and standard date of full moon AD. 1853 Sept., 17.993,023 Cal., NS., Stand. as the mean between the extreme variations of the actual 0.568,302 more and less than the mean in the cycle of variations, from AD. 1853 Sept. 17..10 h..12 m. to AD. 1854 March 14..17 h..53 m. And 29.530,589 reduces to six places of decimals the estimate of Baily 29.530,588,773,1 as stated by Smyth (p. 121). And it gives the mean date of full moon at Babylon JP. 3993 March 19.467,827 counted from midnight, or 0.428,006 less than the actual date of the eclipse, and this is less than the extreme variations 0.568,302 in the fundamental cycle of variations. And to make 29.530,588,773,1 the standard, find the difference in years between the given year and AD. 1853, and multiply this difference by 0.000,002,806,4, and add P. to FGND. if the given year be earlier, or subtract if later than AD. 1853. And this would make 0.007,220,867 or less than 11 minutes to be added to the above date for 2573 years. And the above standard date with mean lunations of 29.530,589 makes the mean date of conjunction AD. 622 July 14..1 h..26 m. which Ideler, the Prussian Astronomer Royal, makes AD. 622..1 h..12 m., while he gives the actual July 14..8 h..17 m. (ME.)

MD. Rule 1. By MDT. find the date of zero in terms of Jan. Min., OS., Stand. Then by Jan. Min. reduce the date to Jan. Cal., OS., Stand. Then verify the calculation by finding the same date precisely by MDB. Then, if desired, add NS. SC. for date NS. And add or subtract for Local time. Then, for other dates of zero, add or subtract mean revolutions to any extent. And for half zero add or subtract half a revolution, except, to the date of the Vernal equinox, add 92.833,333

for Summer solstice, or 186.472,222 for Autumnal equinox, or 276.177,778 for Winter solstice. Then reduce the fraction of a day by the Hour table.

MD. 1st Ex. FGND. in AD. 1853, Sept. 17.993,023, Cal. NS. stand.=lunar standard in MDB., MDC., MDE., and MDT. (MD. Second).

MD. 2d Ex. FGND. in JP. 3993, March 19.467,827, Cal. OS., at Babylon 0.122,674, East Local. This is the earliest lunar date on record and the mean date of full moon at the eclipse which occurred 2,600 years before AD. 1880 and 114 years before the Jewish Captivity, as quoted by Tycho Brahe (Prol. 6) from Ptolemy of Alexandria (Alm. Lib. 4, Chap. 6) in terms of NE. at NE. 27, Thoth 29, at 9 hours, 30 minutes after noon=JP. 3993, March 19.895,833, or 0.428,006 later than the mean (MD. Second; MDE. 2d Ex.).

MD. 3d Ex. VGND.=AD. 1866, March 20.837,442, Cal. NS. Stand.=solar standard in MDB., MDC., and MDT. (MD. First).

MD. 4th Ex. Summer solstice JP. 4282, June 27.336,919, counted from midnight at Athens+0.066,296 Local. This is for the earliest solar date on record, 2300 years before AD. 1869, as given by Tycho Brahe (Prol. 6), as determined by Meton and Euctemon, as the limit of the Olympic year (OE.) in terms of the Era of Nabonassar NE. 316, Phamenoth 21 at 5 or 6 hours after midnight=JP. 4282, June 27 at 5 or 6 hours after midnight, while MD. gives 8 hours, 48 minutes. But Meton had no modern instruments of precision (MD. First).

MD. 5th Ex. The above examples are given to prove the rules. They are also proved by other historic dates (Zero).

MDB.=Mean Date by Basic ages, in terms of JP., Jan. Cal., OS., Stand.

Rule. Assume some date in any Era, a few days later than the date desired. Reduce this assumed date to year JP. and Jan. OS and thence to DJP., to which add the basic age of zero, and divide the sum by the revolution of zero to whole numbers in the quotient, and subtract the remainder from the assumed date in any form, and the remainder will be the mean date of zero in that form in terms of Cal. OS. Stand. Then as MD. Rule 1.

Basic Ages.		VGN. 246.701,622		FGN. 5.078,489 / NGN. 19.843,783
Multiples of Revolutions.	1	365.242,216	1	29.530,589
	2	730.484.432	2	59.061,178
	3	1095.726,648	3	88.591,767
	4	1460.968,864	4	118.122,356
	5	1826.211,080	5	147.652,945
	6	2191.453,296	6	177.183,534
	7	2556.695,512	7	206.714,123
	8	2921.937,728	8	236.244,712
	9	3287.179,944	9	265 775,301
		(4)		(5)

And to expedite the division, use the multiples of revolutions. And to prove division, throw out the 9's in the divisor and quotient, then multiply these remainders, and to the product add the digits in the general remainder and throw out the 9's, and the remainder must be the same as the remainder of the dividend after throwing out the 9's. And to throw out the 9's, add together the digits and divide by 9. Thus 4 is the remainder of 365.242,216, and 5 is the remainder of 29.530,589 after throwing out the 9's.

MDB. 1st to 4th Ex., as MD. 1st to 4th Ex.

MDB. 5th Ex. Mean new moon fell AD. 607, Aug. 28..16 h..3 m..4 sec., counted in Hebrew time. And HC. makes Moled Tisri fall Aug. 28..16 hours exactly. And there is only one chance in 1080 that the date should by accident fall at ⅔ of a day without the difference of a single "scruple" of 3⅓ seconds (HC. Note 125).

MDB. 6th Ex. In AD. 607, VGND. fell March 19.235,646 in Hebrew time, and the full moon March 19.250,589 in Hebrew time, so that the full moon of AD. 607 had passed the equinox 22 minutes, and had just become the full moon of Nisan. And AD. 607=HC. GN. 17, which is the earliest. Hence, the lunar and solar dates by the present Hebrew Calendar (HC.) indicate that it was constructed about AD. 607 (HC. Notes 125, 126).

MDB. 7th Ex. New moon fell BC. 45, Jan. 1.807,962 counted from midnight at Rome (Local)=7 hours, 23 minutes after noon. GN. 1 is dated Jan. 1 in the Julian Calendar (JE. Table). And History says that the Julian Calendar (JE.) began at the date of new moon BC. 45, Jan. 1 (AC. Note 99–101).

MDB. 8th Ex. AD. 325 new moon fell March 31.071,421 counted from midnight at Jerusalem (Local), or March 31.321,421 in Hebrew time. The Alexandrian cycle dates GN. 3=March 31. Jarvis (p. 95) says that in AD. 325 new moon fell March 23, and was marked GN. 1 (MDT. 5th Ex.).

A rough calculation showed that this statement by Jarvis did not correspond with the historic statement of new moon Jan 1, BC. 45. To determine this question MDB. was constructed. And this was the origin of the present work on Calendars, and of a manuscript work on Practical Astronomy (PA.). (AC. Notes 97–101).

MDC.=Mean Date Condensed.

In terms of AD., March Min., NS., Stand. for VGN. and NGN.; and of March NS. for NS. FGN., and of March OS. for OS. FGN.

Zero.	Cy.	Key Date.	Epact.	Revolutions.	AD. to AD.	JE. per cycle.
VGN.	1	20.851,186	0.007,784	365.242,216	1800 to 1899	−0.007,784
FGN.	19	55.556,804	10.882,932	29.530,589	1881 to 1899	−0.061,585
NS. FGN.	19	55 NS.	11	30	1700 to 1899	
OS. FGN.	19	47 OS.	11	30	Forever.	

Then to the date of the Vernal Equinox, add 92.833,333 for Summer Solstice, or 186.472,222 for Autumnal Equinox; or 267.177,778 for Winter Solstice.

MDC. Rule 1. Construction. By MDT. find the date of the vernal equinox in the centurial year in terms of Jan. Min., OS. Stand. Then add NS. SC., and subtract 59 for the day of March NS., and record the result March 20.851,186 as the key date for AD. 1800 to AD. 1900, when NS. SC. adds one day more. And as its epact record the difference between a mean year of 365.242,216 days, and a Julian year of 365.25 days= −0.007,784=JE. in the last column.

Then for FGN.: By MDT. find the date of GN. 1 of the current cycle in terms of Jan. Min., OS. Stand., and add NS. SC., and subtract 59 days for the day of March NS. To this date add the epact in MDT.=10.882,932 and S=key

date, or zero of the cycle, from which zero the date recedes 10.882,932 days per year until it becomes too early, when a lunation of 29.530,589 days is added. Record this key date, and epact, and revolution, and the first and last year of the cycle, and the JE. per cycle= —0.061,585. as in MDT. Thus AD. 1881+4713=JP. 6594;÷19=Q 347+GN. 1. Then 347×0.061,585 from Jan. 113.043,867=Jan. 91.673,872 OS.; +12 NS. SC.—59=March 44.673,872 NS., the date of mean full moon in AD. 1881, GN. 1. Then add the epact 10.882,932=March 55.556,804, the key date.

Then for the ecclesiastical NS. FGN.: To March 24 or 54, add NS. Index of the century for the key date, dated NS. And for OS. FGN. make March 47 OS., the key date "For ever," with epacts 11 days and revolutions 30 days. And mark the limits of NS. FGN. at AD. 1700 to AD. 1899, when NS. Index will change from one day to two days. (AC. Notes 59.)

Then copy the table and memorize the rules, for use during the limits, with less calculation than by MDT. or MDB., for astronomic dates, and including the ecclesiastical dates which are subject to the same rule of key dates. And the insertion of JE. per cycle, makes the table perpetual, so that mean dates can be found for all time, when the more convenient rules of MDT. and MDB., for dates beyond the limits are not at hand. Thus for the day of January add 59 days to the key dates. And subtract 12 days for OS., and then add NS. SC. for the century, for dates NS. And for VGN. multiply by 0.007,784 the difference between AD. 1800 and the given year, and add P to the key date if before or subtract it if after AD. 1800. And for FGN. multiply by 0.061,585 the number of cycles before or after the cycle in the table and add P to the key date if before, or subtract it if after the same GN. in the table.

MDC. Rule 2. For VGND.: Subtract 1800 from the year AD.; and multiply R by the epact, and subtract P from the key date.

MDC. Rule 3. For FGND.: Add *one* to the year AD.; and divide S by the circle 19 for R=GN. Then multiply GN. by the epact and divide P by the revolution, and subtract R from the key date, and 2d R=date of zero.

MDC. Rule 4. For NS. FGND. and for OS. FGND.: Add *one* to the year AD.; and divide S by the circle 19 for R=GN. Then multiply GN. by the epact, and divide P by the revolution; and subtract R from the key date and 2d R=date required, if on or between March 21 and 50. If not, then add or subtract 30 days to bring the date within the limits.

MDC. Rule 5. For the date of Easter: By Rule 4. Find NS. FGND. and OS. FGND., and Sunday next thereafter is the Greek Easter for ever, and NS. Easter during this century. And thus for ever, find OS. FGND., and add NS. SC. and the Sunday next thereafter=Greek Easter, dated NS. And in other centuries, if NS. FGND. fall on March 50 (April 19) retract it to April 18. And if any GN. from GN. 12 to 19 thus fall on April 18, then retract it to April 17. (AC. Notes 66–70.)

MDC. 1st Example. The standard mean date of the vernal equinox in all the rules of MD.=AD. 1866 March 20.837,442; Cal., NS., Stand. (MD. First). Then 1866—1800=66;×0.007,784=0.513,744; from 20.851,186=March 20.337,442 min., in JC. 2. Add 0.50 JCC.=March 20.837,442 Cal., NS., Stand.

MDC. 2d Example. Mean date of full moon in AD. 1891;+1;÷19=GN. 11;× 10.882,932÷29.530,589=leaves 1.589,893, which from 55.556,804=March 53.966,908 min. To which add 0.25 JCC. for Cal.

Then for date outside of the limits, keep the date in minimum Julian time March 53.966,908. Then AD. 1853=GN. 11, at 38 years before 1891=2 cycles× 0.061,585+53.966,908=March 54.090,078; then add 5 lunations of 29.530,589= Sept. 17.743,023 min. Add 0.25 JCC.=Sept. 17.993,023 Cal., NS., Stand.=standard lunar date in all the rules of MD. (MD. Second.)

MDC. 3d Example. For the dates of Easter in AD. 1864;+1;÷19=GN. 3;×11 ÷30 leave 3 from March 55 NS.=March 52 NS.−30=March 22 NS. And 3 from March 47 OS.=March 44 OS., within the limits. Then March 44 OS.+12 NS. SC. =March 56 NS.=April 25 NS. Then Sunday next after March 22 NS.=March 27 NS. the date of NS. Easter. And Sunday next after April 25 NS.=May 1st NS. the date of the Greek Easter at 5 weeks after NS. Easter. (AC. Notes 89, 92, 109–119; AM.)

MDC. 4th Example. Use this reference for

MDT. Construction. For VGND. reverse MDT. 2d Ex., and from the standard AD. 1836 March 20.837,442 NS. Cal. find Jan. 118.548,378 Min. OS. in JP. 0 Then solar dates recede in Julian time 0.007,784 day per year, for the difference between a Julian year of 365.25 days and a mean year of 365.242,216 days. Then:

For FGND. before the equinox (to use them also for Mosaic dates), find VGND. =JP. 1 Jan. 118.540,594. Subtract a lunation of 29.530,589 leaving Jan. 89.010,-005 as in the table for the earliest limit. Then lunar dates recede 10.882,932 days in a common year as in the table, for the difference between 12 lunations and 365.25 days, and advance 18.647,657 for 13 lunations in an embolismic year.

Then reverse MDT. 1st Ex., and from the standard FGND.=AD. 1853 Sept. 17.993,023 NS. Cal. in GN. 11, find JP. 11 Jan. 92.803,314 Min. OS. as in the table, next after the solar date Jan. 89.010,005. Then JP. 11=GN. 11, is 10 years after GN. 1. And 10 × 10.882,932 ÷ 29.530,589 leaves 20.237,553 recession from JP. 1 to JP. 11, which add to 92.803,314 = Jan. 113.043,867 = FGND. of GN. 1 as in the table. Then for FGND. of successive years within the limits and next before the vernal equinox, continue to subtract 10.882,932, unless this leave less than 89.010,005, and in that case add 18.647,657. Thus find all FGND. from JP. 1 to JP. 20, or from GN. 1 to the next GN. 1, and the second will be 0.031,585 day less than the first, because 325 lunations of 29.530,589 days, are 0.061,585 day less than 19 years of 365.25 days, as in MDT. Rule 1.

For lunar dates for all time the GN. and FGND. are alone required. But Mosaic dates are solar as well as lunar, and these are explained under MDT. Mosaic. (HC. Notes 57–67.)

MDE. TABLE.—*MDE.=Mean Dates Expanded. VGND. and FGND. in terms of NS., Stand., Min.*

AD.	VGND. March.	GN.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	+JCC.
1881	20.221	1	15.082	13.613	15.143	13.674	13.204	11.735	11.266	9.796	8.327	7.857	6.388	5.919	0.25
1882	20.213	2	4.199	2.730	4.260	2.791	2.322 31.852	30.368	29.913	28.444	26.974	26.505	25.036	24.566	0.50
1883	20.205	3	22.847	21.377	22.908	21.439	20.969	19.500	19.030	17.561	16.092	15.622	14.153	13.683	0.75
1884	20.197	4	11.964	10.494	12.025	10.556	10.086	8.617	8.147	6.678	5.209	4.739	3.270	2.800	1.00 0.00
1885	20.190	5	1.081 30.612	......	1.142 30.673	29.203	28.734	27.264	26.795	25.326	23.856	23.387	21.917	21.448	0.25
1886	20.182	6	19.729	18.259	19.790	18.320	17.851	16.382	15.912	14.443	12.973	12.504	11.035	10.565	0.50
1887	20.174	7	8.846	7.376	8.907	7.437	6.968	5.499	5.029	3.560	2.090	1.621 31.152	29.682	29.213	0.75
1888	20.166	8	27.493	26.024	27.555	26.085	25.616	24.146	23.677	22.207	20.738	20.269	18.799	18.330	1.00 0.00
1889	20.158	9	16.610	15.141	16.672	15.202	14.733	13.263	12.794	11.325	9.855	9.386	7.916	7.447	0.25
1890	20.151	10	5.727	4.258	5.789	4.319	3.850	2.380	1.911 31.442	29.972	28.503	28.038	26.564	26.095	0.50
1891	20.143	11	24.375	22.906	24.436	22.967	22.497	21.028	20.559	19.089	17.620	17.150	15.681	15.212	0.75
1892	20.135	12	13.492	12.023	13.553	12.084	11.615	10.145	9.676	8.206	6.737	6.268	4.798	4.329	1.00 0.00
1893	20.127	13	2.609	1.140	2.670	1.201 30.732	30.262	28.793	28.323	26.854	25.385	24.915	23.446	22.976	0.25
1894	20.119	14	21.257	19.788	21.318	19.849	19.379	17.910	17.440	15.971	14.502	14.032	12.563	12.093	0.50
1895	20.112	15	10.374	8.905	10.435	8.966	8.496	7.027	6.558	5.088	3.619	3.149	1.680	1.210 30.741	0.75
1896	20.104	16	29.022	27.552	29.083	27.613	27.144	25.675	25.205	23.736	22.266	21.797	20.328	19.858	1.00 0.00
1897	20.096	17	18.139	16.669	18.200	16.730	16.261	14.792	14.322	12.853	11.383	10.914	9.445	8.975	0.25
1898	20.088	18	7.256	5.786	7.317	5.848	5.378	3.909	3.439	1.970 31.501	30.031	29.562	28.092	27.623	0.50
1899	20.081	19	25.903	24.434	25.965	24.495	24.026	22.556	22.087	20.618	19.148	18.679	17.209	16.740	0.75

MDE. Rule 1. *Construction.* By MDT. find the date of the vernal equinox AD. 1881, Jan. Min. 67.220,682 OS. Stand. Then add 12 NS. SC., and subtract 59 for March min. 20.220,682 NS. Stand. Then continue to subtract 0.007,784 for the difference between a Julian year of 365.25 and a mean year of 365.242,216. And this continued to AD. 1900=March 20.072,986. But Feb. 29 is omitted in AD. 1900, and makes NS. SC=13 days, so that in AD. 1900, VGND.=March 21.072,986 min.

Then, for FGND.: By MDT. find the date of full moon AD. 1881=GN. 1, Jan. Min. 15.082,105 NS. Stand. Then as for MDT., continue to subtract 10.882,932, unless this gives the date before Jan. 1st, and then add 18.647,657, which is the same as 10.882,932 subtracted to find the date of the twelfth moon, and then a lunation of 29.530,589 added to find the next later moon. Thus find all the moons which fall in January during the cycle. And then to each continue to add lunations of 29.530,589 days to the end of the year in the day of Jan. And then by Jan. Min. table, translate Jan. Min. into Month min.

MDE. Rule 2. To perpetuate MDE. Table. For VGND., add 4713 to the year AD. for the year JP. Multiply the year JP. by 0.007,784 and subtract P from Jan. 118.548,378 for VGND. in terms of Jan. Min., OS., Stand. Then add NS. SC. and subtract 59 for the day of March Min., NS., Stand.

Then for FGND.: Add one to the year AD. and divide S by the circle 19 for R=GN. Then find the difference between that year and the year in the table which has the same GN. Divide by 19 this difference of years, and multiply Q by 0.061,585, and add the product to all the FGND. in the table if the given year be before the date in the table, or subtract it if after that date, for all the dates in the new cycle from GN. 1 to GN. 19—provided they be in the same century. And if not, then subtract 12 days and add NS. SC. for date NS.

MDE. 1st Example. AD. 1853+1; ÷19=GN. 11, =38 years before AD. 1891. Then 38÷19=2;×0.061,585=0.123,172, which add to Sept. 17.620 in the table= Sept. 17.743 min. in JC. 1. Add 0.25 JCC.=Sept. 17.993, Cal. NS. And the standard FGND.=Sept. 17.993,023 (MD. Second).

MDE. 2d Example. Compare the mean dates in the table +JCC.=0.25 with the actual dates (in parentheses) as given in ANA. in AD. 1881=GN. 1, viz.: Jan. 15.332 (15.482); Feb. 13.863 (14.267); Mar. 15.393 (15.942); April 13.924 (14.493); May 13.454 (13.933); June 11.985 (12.290); July 11.516 (11.592); Aug. 10.046 (9.880); Sept. 8.577 (8.194); Oct. 8.107 (7.583); Nov. 6.638 (6.085); Dec. 6.169 (5.718). Hence the actual was 0.569 more than the mean in April, and 0.553 less than the mean in Nov. The extremes were 0.568,302 more and less in the standard cycle of variations (MD. Second). (AC. Table 1.)

MDE. 3d Example. Compare the same with the medium dates of GN. 1 distributed in the Egyptian cycle in AC. Table 1, and the days are the same except 0.076 less in April and 0.015 in June. But this is unusually close for the Egyptian cycle, which counts nothing less than whole days, and makes no difference for the extra day in a leap year.

MDT. Construction. (MDC. 4th Example.)

MDT.=Mean Date by Table. In terms of JP., Jan. Min., OS., Stand. *Rule* 1. For FGND. Divide the given year JP. by the circle 19 for Q of past cycles and R=GN. Then multiply Q by 0.061,585, and subtract P from FGND. opposite to GN. as found, and R=FGND. in terms of Jan. Min., OS., Stand. Then reduce Jan. Min., OS., Stand. (MDC. 4th Ex.)

MDT. Rule 2*d.* For VGND. multiply the given year JP. by 0.007,784 and subtract P from Jan. Min. 118.548,378 and R=VGND. in terms of Jan. Min., OS., Stand. Then reduce.

MDT. 1*st Ex.* For FGND. in AD. 1853;+4713=JP. 6566;÷19=Q 345 + GN. 11. Then 345 × 0.061,585 from FGND. 92.806,314 = FGND. Jan. Min. 71.559,489 OS. Add 12 NS. SC. for date NS. and 0.25 JCC. for cal. and 177.183,534 for 6 lunations = Jan. Cal. 260.993,023=Sept. 17.993,023 the standard mean date of full moon (MD. 1st Ex.).

JP. Year of Coinci.	AD. Year of Coinci.	GN.	89.010,005 −10.882,932 +18.647,657 FGND.
1211	2998	1	113.043,867
3606	5393	2	102.160,935
6001	7788	3	91.278,003
1896	3683	4	109.925,660
4290	6077	5	99.042,728
185	1972	6	117.690,385
2580	4367	7	106.807,453
4974	6761	8	95.924,521
869	2656	9	114.572,178
3264	5051	10	103.689,246
5659	7446	11	92.806,314
1553	3340	12	111.453,971
3948	5735	13	100.571,039
6343	8130	14	89.688,107
2238	4025	15	108.335,764
4632	6419	16	97.452,832
527	2314	17	116.100,489
2922	4709	18	105.217,557
5317	7104	19	94.334,625
		2d 1	112.982,282
		1st 1	113.043,867
		JE.	−0.061,585

MDT. 2*d Ex.* For VGND. in AD. 1866. Then 1866 + 4713 = JP. 6579; ×0.007,784 from 118.548,378=Jan. Min. 67.337,442 OS. Add 12 NS. SC.= March Min. 20.337,442 NS. In JC. 2 add 0.50 JCC.=March 20.837,442 NS. Cal., the standard in MD. 3d Ex.

MDT. Mosaic. Rule. If the given year be not before the year JP. of coincidence, and not as late as the year AD. of coincidence, find FGND. by the rule of MDT. in minimum standard time. Then add 0.098,148 for the local time at Jerusalem, and 0.25 for Hebrew minimum time counted from 6 hours before midnight at Jerusalem, and the result will be the date of the Mosaic full moon of Nisan, on or within one lunation after the vernal equinox. But if the given year be before the year JP. of coincidence, then add to FGND. thus found a lunation of 29.530,589 for the date of the Mosaic full moon of Nisan. And if the given year be on or after the year AD. of coincidence, then subtract a lunation from the date thus found. (HC. Notes 56–67; AC. Notes 82, 90.)

MDT. 3*d Ex.* For FGND. Mosaic in AD. 1883; +4713=JP. 6596; ÷19=Q 347+GN. 3. This is between JP. 6001 and AD. 7788, so that no correction is required. Then by MDT. 347 × 0.061,585 from 91.278,003 = FGND. Jan. Min. 69.908,008 OS. Stand. Add 12 NS. SC. and in Jan. Min. table find March Min. 22.968,008. Then for JC. 3 add 0.75, and for Hebrew time add 0.348,148=March 24.003,153 Cal. Hebrew. (HC. Notes 20, 28–33.)

Note. HC. Table shows AD. 1883=HC. GN. 1, and Moled Tisri Oct. 2..0..879.

For full moon of Nisan subtract 162..10..42 leaves April 22..14. 837. And April 22 is the date of the passover. Then subtract one HC. lunation of 29..12..793 leaves March 24 2 h..44 scruples. This shows that in HC. GN. 1 the HC. full moon is the full moon of Zif. (HC. Notes 20, 28–33.)

MDT. 4th Ex. For full moon of Nisan in maximum Hebrew time for consecutive years for AD. 1800 to AD. 1818 in AC. Note 89: Find the date of the vernal equinox AD. 1807, Jan. 67.796,698 in minimum standard time OS. Then add 12.00 NS. SC. for NS., and 0.75 JCC. for max., and 0.348,148 for Hebrew time, and subtract 59 for the day of March, make March 21.894,846 max. Hebrew the date of the vernal equinox in AD. 1807. Then make this the limit for the earliest date of the full moon of Nisan.

Then find the date of full moon AD. 1807, March 24.252,496 in maximum Hebrew time. Then, as in the construction of MDT. table, continue to subtract 10.882,932 for next year, unless that make the date earlier than the equinox, and then add 18.647,657 (or the difference between a lunation of 29.530,589 and an epact of 10.882,932). This is in maximum time to agree with the Egyptian rules, so as to take the latest date upon which the moon can fall. (AC. Notes 89–91.)

MDT. 5th Ex. For full moon of Nisan in calendar time, counted from 6 hours before midnight at Jerusalem from AD. 1883 to AD. 1903: Find the minimum standard date OS. of the vernal equinox in AD. 1883, Jan. min. OS. 67.205,114. Then add 12 days NS. SC., and 0.348,148 for Hebrew time, and 0.75 JCC. for calendar time=maximum in JC. 3, and subtract 59 for the day of March. These make the date of the vernal equinox AD. 1883, March 21.303,270. Make this the limit. Then find the date of full moon, next after the equinox AD. 1883, March 23.256,153 in minimum Hebrew time, and from this and subsequent dates subtract 10.882,932 unless this give the moon before the equinox, and then add 18.647,657 to find the date of the full moon of Nisan of the next year in minimum Hebrew time. Then for calendar or actual time counted from 6 hours before midnight at Jerusalem, add to these dates JCC.=0.00 in JC. 0; 0.25 in JC. 1; 0.50 in JC. 2; 0.75 in JC. 3. (AC. Notes 89.)

These dates are in calendar, or ordinary time, to compare with dates by HC. and HCM., because those dates are in calendar time. And either of these dates can be found by MDT. Mosaic. And the years of coincidence show that all the GN. in that table give the full moons of Nisan from AD. 1883 to AD. 1903, so that March 21.666,160 min. in 1894 being the carliest, this might be made the limit instead of the equinox March 21.303,270. And for tabulating, the dates are first found in Julian years of 365.25 days, because uniform, and then by JCC. reduced to the irregular calendar time with 3 years of 365 days, and one year of 366 days.

MDT. Mosaic. Explanation. 19 mean years of 365.242,216 days=6939.602,104. And 235 lunations of 29 530,589 days=6939.688,415. The difference 0.086,311 divided by 19=0.004,542,68 day per year, that the 235th moon represented by any GN. advances in mean equinoxial date. And this divided into 29.530,589= 6500,697 years that the moon represented by any GN. will advance a full lunation later than the vernal equinox and become the moon of Zif. And 6500÷19=342.1 years interval, at which the GN. in succession reach the same equinoxial date, and in the reverse order of the GN. rule, or add 11 or subtract 8 years.

Now: In MDT. table, the limit is one lunation before the vernal equinox in JP. 1. Hence all the FGND. are before VGND. from JP. 1 to JP. 19, and are

the Mosaic full moons of Adar in terms of JP., Jan. min., OS., Stand., in the first JP. cycle. The latest=Jan. min. 117.690,385 of JP. 6. This will first reach VGND. and become the Mosaic full moon of Nisan. Then for VGND. in JP. 6; 6×0.007,784 from 118.548,378=VGND. 118.501,674, subtract 117.690,385=0.811,-289 that FGND. was before VGND. This divided by 0.004,542,68 gives 179 years for FGND. of GN. 6 to reach VGND., so that JP. 6+179=JP. 185 the year of coincidence of GN. 6. Then to JP. 185 continue to add 342.1 for the successive years of coincidence, and for the corresponding GN. continue to add 11 in a circle of 19 to GN. 6, and record these years JP. of coincidence opposite to their respective GN., as the years in which the FGND. represented full moon on or next after VGND. Then add 6500 years for the years of coincidence of the next earlier moon in the same year and record this date in terms of AD. Hence: "JP. year of coincidence" gives the year in which the full moon of that GN. advances from Adar to Nisan, and becomes the moon of Nisan, and the "AD. year of coincidence" 6500 years later, gives the year in which the same moon will advance to the month Zif, and the full moon one lunation earlier will coincide with the vernal equinox and become the full moon of Nisan. This is in accordance with the Mosaic rule. But not according to the present Hebrew Calendar. (AC. Notes 6–11, 75–80.)

MDT. 5th Ex. In AD. 325 new moon fell March 31.321,421 in Hebrew time. (MDB. 8th Ex.) (AC. Note 101.)

ME.=Mohammedan Era=Turkish Calendar. (C.)

Mean dates and revolutions, are the means between the extreme variations of the actual more and less than the mean. To these mean dates corrections are applied to find the actual, according to the conditions which produce these variations. (MD. 1st, 3d Ex.)

Meridian, is a great circle of the earth which passes through the poles, the zenith and the nadir, and is true North and South along the earth. The word signifies *noon*, and at apparent noon, the sun is on the meridian. (Prime, Greenwich.)

Metonic Cycle (OE.).

Min.=Minimum Julian time. (JCC., Jan. Min.)

Missale Romanum=Service Book of the Church of Rome, and contains NS. in the Roman form, while the Anglican Prayer Books contain NS. in the Anglican form, and more simple to reach the same result. (NS. Table 7. AC. Notes 120–130.)

Mohammedan Era=ME. (C.)

Moled=Birth of the moon=new moon. Moled Tohn=Birth of the moon at the Creation=first Moled Tisri=mean conjunction in Hebrew time counted from 6 hours before midnight at Jerusalem, and making 18 hours signify conjunction at noon of the date found by rule.

Month, Cal. and *Min.*=day of the month, Cal. or min.

Moon, new and full. (MD.)

Mosaic time=Hebrew time. And Mosaic rule made it impossible for Nisan to begin before 18 hours after conjunction, or full moon to fall later than the end of the 14th Nisan. And the Mosaic full moon of Nisan, fell on or next after the vernal equinox. (AC. Notes 6–11, 75–80.)

Movable Feasts, depend upon the date of Easter in NS.; OS.; AM. (C.)

Nabonassar, Era of=NE. (C.)

Nadir=Plumb downwards (Zenith).

Nautical time is 12 hours less than Standard.

NC.=Nicean Calendar. (AC. Note 1; JE. Table.)

NE.=Era of Nabonassar. (C.)

New Moon=Moled, NGN., MD.

NGND.=New Moon GND.

Nicean Calendar=NC.

Nisan=First Mosaic month. And 14th Nisan was the Mosaic date of the full moon, which fell on or next after the vernal equinox.

Nodes=points where the moon crosses the equator and the ecliptic. (DAGND.; DDGND.; LAGND.; LDGND.; Zero.)

Nomikon Pascha, i. e., Passover by the Law=date of AM. GN., to represent the date of the full moon of Nisan. (AM., MDC.)

Nones or Ninths, by Roman account, but as we count, 8 days before the Ides. (Ides, JE. Table.)

NS. Introduction. NS.=New Style=Gregorian Calendar (C). All dates AD. were OS., until 10 days NS. SC. were added to Oct. 5, making Oct. 5–15 AD. 1582 in Rome, Spain, Portugal; Dec. 10–20 AD. 1582 in Brabant, Flanders, Hainault; Dec. 15–25 AD. 1583 in France; AD. 1585 in the Romish provinces of Germany; AD. 1586 in Poland; AD. 1587 in Hungary. Then 11 days Sept. 4–15 AD. 1752 in England and colonies; AD. 1778 in Prussia. The Russo-Greeks still retain OS. And this began with JE., Jan. 1 BC. 45. (Year.)

NS. SC.=NS. Solar Correction=12 days from March 1 AD. 1800 to March 1 AD. 1900, and then 13 days from March 1 AD. 1900 to March 1 AD. 2100, etc. *Rule:* Subtract 12 from the centuries AD. Divide R by 4 for Q and 2d R. Multiply Q by 3 and to P add the 2d R and the constant 7 and S=NS. SC., which added to OS.=NS., and subtracted from NS.=OS. Thus for AD. 1800. $18-12=6$; $\div 4=$Q $1+2$; Q $1\times3+2+7=12$ NS. SC. (NS. Table II.)

Nundinal Letters=A to H, repeated through a common year in the Julian Calendar, to indicate each "Ninth" day in Roman account, or each eighth day as we count. This was the origin of our Sunday Letters to indicate each seventh day throughout the year. (JE. Table.)

OE.=Olympic Era=Olympic Calendar. (C.)

Old=number of days after conjunction.

Olympiads=OE. (C.)

Oriental Church=Russo-Greek Church=AM. (Westerns.)

OS.=Old Style, as dates were counted before NS. Introduction. It counts all years AD., which leave no remainder when divided by 4, to be leap years. This includes AD. 1800, 1900, 2100, etc., which NS. counts as common years. The astronomical rules for all time MDB., MDT., are in OS., and each fourth year is counted a leap year, and this is carried back to the beginning of JP., on account of its uniformity. Then when required after NS. Introduction OS. is reduced to NS. by adding NS. SC. But the Russo-Greeks still retain OS., and in correspondence with Westerns both dates are given, as April 1–13, 1885. (JE., MDC.)

OS. FGND. (MDB.)

PA.=Practical Astronomy. (Zero.)

Pascha. (Hgion, Nomikon, AM.; MDC., AC. Notes 108–119.)

Paschal Canons. These were the solar portions of the first Christian Calendar (NC.), and fixed the date of Easter on Sunday next after the full moon of Nisan.

which fell on or next after the 21st day of March. And March 21 was the maximum Julian date of the vernal equinox in AD. 325, or the actual date in each third year after leap year, while it fell on March 20 in AD. 325. This might make Easter fall later than the date determined by the Council of Nicea, but it prevented Easter falling on the 14th Nisan (the anniversary of Crucifixion), as the main object of the Council. (AC. Notes 1–11.)

Paschal Limits=March 21 and April 18. (AC. Notes 66–70.)

Passover, falls on the 15th Nisan. By the Mosaic rule the 15th Nisan was the day *after* full moon. By the present rules, the 15th Nisan is the day *of* full moon, and GN. HC. 1, 9, 12 make it the full moon of Zif. (AC. Notes 6–11, 75–80, 89.)

Perigee=PGND.=moon nearest to the earth. (AGND.)

PGND.=Perigee GND. (Zero.)

Poles of the earth=points in the heavens around which the stars appear to revolve. And equidistant from the equator. Poles of the heavens are equidistant from the ecliptic.

Precession of the equinoxes. (Equinox; AC. Notes 99, 101, 129, 130; NE. Notes 19–35.)

Pref.=Preface to the Calendars.

Precise. The astronomical rules (MD.) are in precise accordance with a mean year of 365.242,216 days, and a mean lunation of 29.530,589 days. (MD. First and Second.)

Prime meridian=standard of longitude and time. In 1874 the delegates from many nations met at Washington, D. C., and all except the French, agreed to make Greenwich, Eng., the universal prime meridian, and to count time from midnight at Greenwich. Previously GNA., and the nautical part of ANA. counted in Nautical time from noon at Greenwich. This was used by all English-speaking navigators, who were said to be 70 per cent. of the whole. (Stand.)

The prime meridian of the Hebrew Calendar in ancient times was Jerusalem, since the date depended on the appearance of new moon at Jerusalem. The present Hebrew Calendar gives the date of the new moon on the basis of Jerusalem as the prime meridian. All Christian calendars (NC., OS., AM. NS.) have been framed to give the correct date of Easter. And Easter is a Hebrew date. So that Jerusalem is the prime meridian of all Hebrew and Christian calendars. It would be a better prime meridian for longitude and time than is Greenwich. But the change would cause large expenses for new charts, and might at first produce confusion.

R=Remainder.

Recession, per cycle=JE. if marked minus= – (MDC., MDT.). Also of the vernal equinox=0.007,784 day per year in terms of OS. for the difference between a Julian year of 365.25 days, and a mean year of 365.242,216 days. Also of the moon represented by any GN. in terms of OS.=0.003,241,316 day per year, for the difference between the recession of the equinox 0.007,784 day per year, and the advance of the moon in equinoxial date 0.004,542,684,2 day per year. (AC. Notes 31, 36.)

Retraction NS., of all GN. which fall on April 19, and of all from GN. 12 to 19 which fall on April 18, to keep them within the Paschal limits, March 21 and April 18. (AC. Notes 66–70.)

Right Ascension=AR.

Roman Calendars=AU.; JE. And the Romans counted both extremes, making one more than we count, as shown by the dates in JE. Table and Nundinal letters. And as the French now call a week=Eight days, and two weeks=Fifteen days.

Russo-Greek Church=AM. (C.)

Sign (Equinox; Zodiac).

Solar Correction=NS. SC. and AC. SC. (AC. Notes 31, 41–46.) Also in HCM. to keep the full moon of Nisan, on or the next after the vernal equinox.

Solar Cycle. Rule: Find the year of the solar cycle from the year JP. in the rule for Chronological Cycles. And opposite to that year find the Dominical OS. in the Solar Cycle OS., and the Dominical NS. in the Solar Cycle NS., as follows·

Solar Cycle OS.—for ever.

1	g, F	5	b, A	9	d, C	13	f, E	17	a, G	21	c, B	25	e, D
2	E	6	G	10	B	14	D	18	F	22	A	26	C
3	D	7	F	11	A	15	C	19	E	23	G	27	B
4	C	8	E	12	G	16	B	20	D	24	F	28	A

Solar Cycle NS.—March 1, 1800, to March 1, 1900.

1	e, D	5	g, F	9	b, A	13	d, C	17	f, E	21	a, G	25	c, B
2	C	6	E	10	G	14	B	18	D	22	F	26	A
3	B	7	D	11	F	15	A	19	C	23	E	27	G
4	A	8	C	12	E	16	G	20	B	24	D	28	F

For any other century, add one day to NS. SC., and divide S by the circle 7, and R 1 to 7=A to G=Dominical for year 28 of the cycle. Then as above, write down the letters A to G and repeat, doubling the letters at the leap years, and the small letters are for dates before Feb. 29, in the years of the cycle 25, 21, 17, 13, 9, 5, 1. Or find the same by the memorized rule for the Dominical.

Solar Cycle of AM., is not as convenient as Solar Cycle OS., and gives the same result. (AM.)

And the Solar Cycle NS. can be used for OS. dates after adding NS. SC. to find the corresponding date NS. And *vice versa.* (MDC. 3d Ex.)

Solstice. Summer Solstice is when the sun is at the Tropic of Cancer, and furthest North, at Declination 23° 27′ North of the Equator. The Winter Solstice is when the sun is at the Tropic of Capricorn, and furthest South, at Declination 23° 27′ South of the Equator. The average time of the four cardinal points in the year are 20, 21, 23, 22 of March, June, September, December. (Equinox.)

Stand.=Standard time counted from midnight at Greenwich. (Local, Nautical, Civil, Prime.)

Sunday Letters. Memorized (AC. Note 71; JE. Table).

Synodic revolution of the moon, from full to full, or from new to new=a mean lunation of 29.530,589 days.

Syzygy=new and full moon=sun, moon, and earth "joined together."

Thoth=Beginning of the Egyptian year (AE.; NE.).

Transit=sun, moon, or star on the meridian.

Tropic (Solstice).

Tropical year=mean year of 365.242,216 days.

Turkish Calendar (ME.).

Variations of actual from mean. (MD. 1st, 2d Ex.)

Vernal equinox=VGN. (Equinox, MDB., MDC., MDT.).

VGN.=Vernal equinox=Zero of solar dates.

Visible new moon determines the beginning of the Turkish year, as it did the beginning of the Mosaic year. But at present the Hebrew year begins before conjunction (ME., AC. Notes 6–11, 75, 76).

Wandering year=Canicular year of the Egyptians contained 12 months of 30 days and 5 epagomenai=365 days. It therefore receded in Julian time one day in four years, and hence was called the Wandering year (NE., AE. HC. Notes 139–156).

Westerns=those who use GN. JP. in the form of GN. OS. or GN. NS., as distinguished from the Orientals, who use GN. AM. (AC. Notes ; AM., OS.).

Year. A mean or equinoxial year=365.242,216 days. A Julian year=365.25 days. A lunar year=354 days or 12 lunations alternately 30 and 29 days. The Hebrew years have 353, 354, 355, 383, 384, 385 days (HC.).

Year Beginning and adoption of NS. The year began in England and Ireland on Dec. 25, until changed to Jan. 1, 1067 ; then to March 25, in 1155, for the legal and ecclesiastical year, but Jan. 1 was considered the beginning of the Julian year. Then the "supputation" from March 25 (Annunciation day) shall be changed to Jan. 1, 1752, and Sept. 3 be called Sept. 14, 1752 (CP. of 1607 and Bond Pref. 19). The year began in Scotland on March 25 until Jan. 1, 1600. In France on Dec. 25, and Easter eve, and March 25 until Jan. 1, 1564, and NS. was adopted Dec. 11–21, 1582. In Rheims on March 25 from 12th century ; in Diocese of Soissons, Dec. 25 in 13th century. In Amiens on Easter eve in 13th century. In Picardy on Jan. 1, after 13th century. In Languedoc and many other southern provinces on March 25 before 12th century, and on Easter eve in 12th and 13th centuries. In Toulouse on Easter eve until 1564. In Narbonne and Pays do Foix on Dec. 25 until 1564. Diocese of Limoges on Easter and March 25 in 1301. In Poitou, Normandy, and Anjou on Dec. 25, when they fell into the hands of the English. In Dauphiny on March 25 towards the end of the 13th century, then Dec. 25 in the 14th century, and called "Le Style Delphinal." In Province from Dec. 25 to Jan. 1, and March 25 and Easter in 11th, 12th, 13th cent. Besançon on March 25 before 15th cent., then Jan. 1 in 15th cent., and settled by edicts in 1574, 1575, 1576. Montbilliard on Jan. 1 and March 25 before 1564. In Germany on Dec. 25, until Jan. 1, 1544 (and NS. adopted by Roman Catholics Dec. 22—Jan. 1, 1583, and by Protestants 19 Feb.—1 March, 1700). In Cologne on Easter before 1310, then Dec. 25 in 1310. In Cologne University, March 25 until 1428 ; in Mentz or Mayence, Dec. 25 until 15th cent., then Jan. 1. In Prussia on Dec. 25 until Jan. 1, 1559 (and NS. in 1583). In Roman Catholic Netherlands Jan. 1, 1556 (and NS. adopted in Flanders, Brabant, Artois, and Hainault Dec. 25, 1582=Jan. 1, 1583). In Protestant Netherlands=Holland, Zealand, Friesland, Gröningen, Overyssel, Utrecht, Guilderland, Zitphen on Jan. 1, 1586 (and NS. Feb. 19=March 1, 1700). In Lorraine on Dec. 25, and on March 25, and on Easter before Jan. 1, 1579 (and NS. Dec. 10–20, 1582). In Rome, Milan, and a great part of Italy, on Dec. 25 in the 13th, 14th, 15th

centuries, until Jan. 1, 1582 (and NS. on Oct. 5–15, 1582). In Tuscany on March 25 from 10th century to Jan. 1, 1751, known as the "Era of Florence." In Venice on March 1 for the legal year before 1522, then Jan. 1, 1522, for civil and legal year. In Savoy on Easter before Jan. 1, 1635 (and NS., Dec. 22=Jan. 1, 1583, and NS. in Hungary, 1587). In Sweden on Jan. 1, 1559 (and NS. on March 1–12, 1753). In Denmark on Dec. 25 or Aug. 12, until Jan. 1, 1559 (and NS. on Feb. 19—March 1, 1700). In Lausanne and Pays de Vaud on March 25, until in the Grisons, Jan. 1, 1717, and Swiss Cantons, Jan. 1, 1739 (and NS. by Roman Catholics Dec. 22—Jan. 1, 1583, and by Protestants Jan. 1–12, 1701). In Spain on Jan. 1, 1556 (and NS. on Oct. 5–15, 1582). In Arragon on March 25 until Dec. 25, 1350, then Jan. 1, 1556. In Castile on March 25 until Dec. 25, 1383, then Jan. 1, 1556. In Portugal on March 25, then Dec. 25, 1420, then Jan. 1, 1556 (and NS. on Oct. 5–15, 1582). In Russia in the spring in 11th century, then Greek Calendar, then Jan. 1, 1725 (NS. has not been adopted by Russia and Greece). In Poland on Jan. 1, 1626. In France Sept. 22, 1792 and Jan. 1, 1806, and leap year, called the "Olympic year" (Bond, pp. 17–28; Jarvis, pp. 95–97).

Zero=The point in a revolution that is used as the standard from which to measure other points. And half zero=half a revolution. In PA. these terms are used for FGN., NGN., AGN., PGN., DAGN., DDGN., LAGN., LDGN. But for calendars the first three only are required (MDB., MDC., MDE., MDT.).

Zodiac. The sun in its annual round passes through twelve constellations of the fixed stars, and most of these being supposed to represent animals, these constellations are called the zodiac, from the Greek word *Zōon*, an animal. And 30 degrees along the ecliptic is assigned to each, and is called a Sign of the Zodiac. The point where the sun strikes the equator at the vernal equinox is called "the First point of Aries." Then counting eastward, the signs and constellations follow in this order: The Ram, Bull, Twins, Crab, Lion, Virgin, Scales, Scorpion, Archer, Goat, Waterman, Fishes. These can be remembered by the following distich in Latin:

Sunt Aries, Taurus, Gemini, Cancer, Leo, Virgo,
Libraque, Scorpius, Arcitenens, Caper, Amphora, Pisces.

But the "Precession of the equinoxes" has carried the astronomers' "First point of Aries" westward among the stars about one sign of the zodiac, or 30 degrees, so that *Hamal* (the brightest star of Aries, and near its western border) culminates two hours after the astronomers' first point of Aries. And in like manner all the other constellations are about two hours later than the astronomers' Signs of the Zodiac of the same name.

These astronomical facts are involved in the examination of ancient calendars. But they would be unknown if there were no fixed stars. They have no effect upon the seasons. These depend exclusively upon the revolution of the earth around the sun, without regard to the fixed stars. Jarvis and Seabury are two of the three who are known to attribute to the Precession of the equinoxes the recession of dates that was caused by the difference between the artificial Julian year of 365.25 days and the equinoxial year of 365.242,216 days (AC. Notes **99, 101; 129, 130**).

AUTHORS.*

* A figure standing alone = number of the note, as HC. 8; and with p. = page, as HC. (p. 11), and with Ex. = Example, as MDC. 3 Ex.; (A.), *i. e.*, in Appendix.